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The ELECTRICAL REVIEW

FOUNDED 1872

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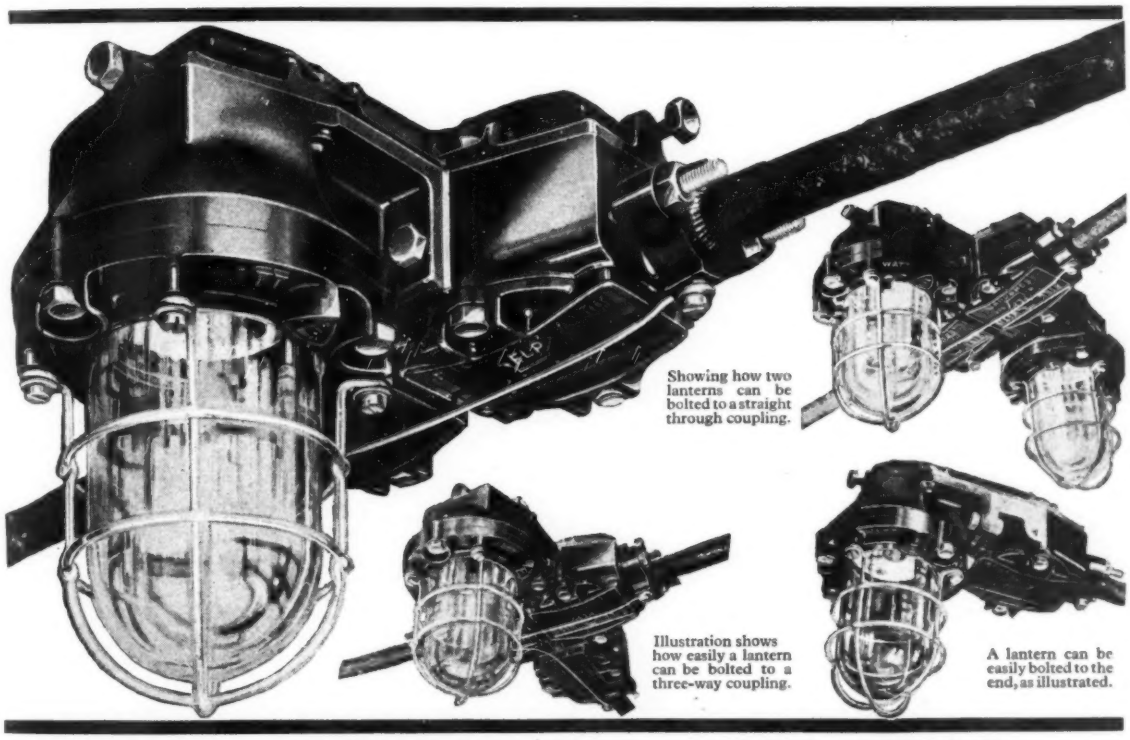
ELLISON The FLAMEPROOF LIGHTING EQUIPMENT OF THE FUTURE



Showing how two lanterns can be bolted to a straight through coupling.

Illustration shows how easily a lantern can be bolted to a three-way coupling.

A lantern can be easily bolted to the end, as illustrated.

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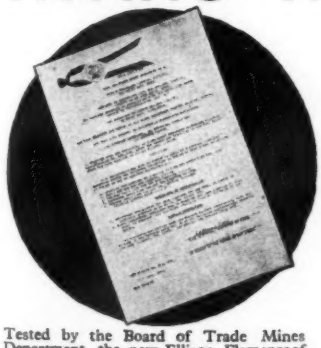

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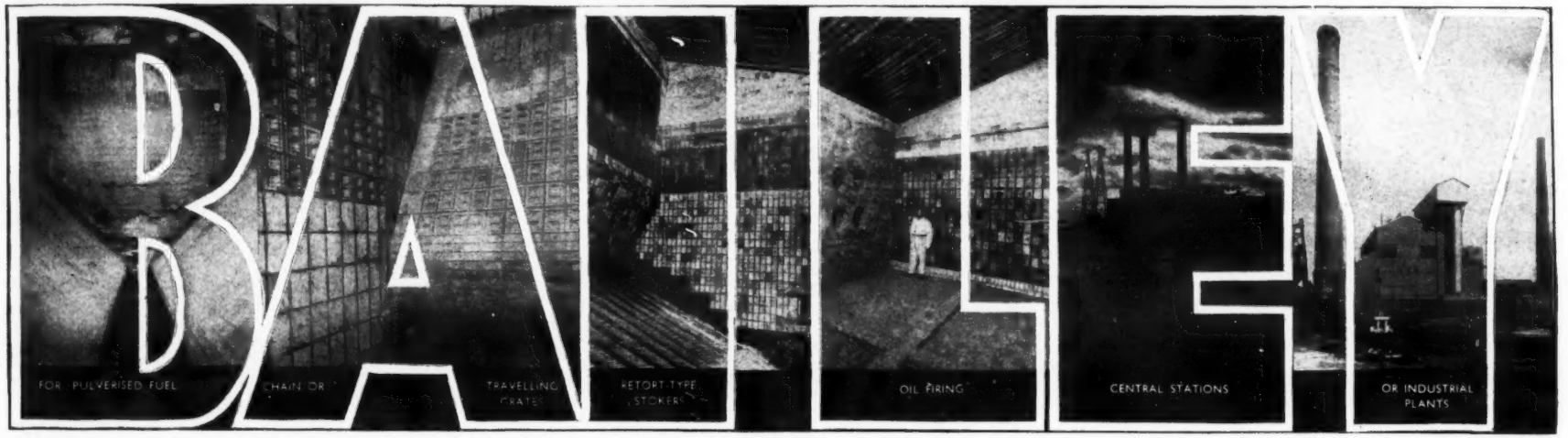

May we send you a copy of each of the following papers, which if read in the order given form a very complete treatise on the question of modern furnace design for water-tube boilers.

No. 961—Walls for Boiler Furnaces.
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The
Electrical Review

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The Ironmongers' Claim

WHEN the Ironmongers' Federated Association formed an Electrical Section some months ago we thought it quite natural for them to do so. The ironmongers had been in the electrical field for a long time, and it was only to be expected that those of them with large electrical businesses should wish to get together to discuss matters of common interest.

We are afraid that we did not visualise yet another Association for the industry, which already has as many as is good for it. The idea was, we thought, that the I.F.A. should have a committee to watch electrical matters and, where possible, to lend its aid to electrical bodies who were trying to improve trading conditions in the industry.

The Section is prepared to do this, but it wants to do it as an entirely independent unit, and it has applied for representation upon the Fair Trading Council. The electrical contractors (with some justice) fail to see why the electrical ironmongers should not be content to join the appropriate existing association (the N.E.C.T.A.) as ordinary members.

There was a time when electrical contractors (and retailers) looked askance at the entry of ironmongers into the electrical business. Presumably it is safe to assume that a change of heart has lately taken place. Such a change was necessary in the face of an accomplished fact. To-day the ironmongers have a firm footing in the electrical retailing business, and the purely electrical interests are scarcely in a position to drive them out, even if they are sometimes disposed to feel that they ought to try.

But the E.C.A. and its allied associations are entitled to smile wryly when they hear that ironmongers are complaining of municipal competition—that age-long bugbear which still pursues them.

The matter was raised at the last meeting of the Committee of the Electrical Section of the I.F.A., and the following rather ingenuous resolution was put forward:—

"That this Federation appeals to the Electricity Commissioners that wherever electrical showrooms are established they shall be for the benefit of the traders rather than for the benefit of those who are distributing electricity."

Can it be that the ironmongers have not heard the sad story of Committee D; that they are unaware of the fight which the E.C.A. has carried on for years and years? Do they not realise how the Fair Trading Council has arisen and why it is so long getting its policy into operation? Let us assure the ironmongers that they can blow themselves blue in the face and still leave unshaken the walls of the municipal trading Jericho.

If they really wish to take a hand in cleaning up the electrical trade, they will find it advisable to co-operate with those who are thoroughly conversant with the situation and will welcome assistance. But to add another section to the industry will merely have the effect of further dissipating the energies which should be concentrated upon the solution of the difficult problems which the Fair Trading Council has in hand.

More Appointments Vacant

ONE of the many pleasing signs of the prevailing activity in the electrical industry, as well as one of its most welcome consequences to those engaged therein, is the substantial increase in the number of situations and other appointments vacant advertised in the ELECTRICAL REVIEW. It may seem almost presumptuous or superfluous to commend these announcements to the attention of our readers, for they have always formed a very popular feature of this journal; yet we do feel that a study of them at this time is a very encouraging occupation, whether made with the usual object in view, or for the purpose of gauging the trend of things. There are, of course, no statistics available yet to show the definite effects of increased trade upon employment in particular sections of the industry, but the flow of big business during the past six to twelve months will probably prove to have spread its influence over all

departments. Big contracts for power station equipment, railway electrification and telephone extension, as well as the progress in electricity supply and in domestic applications, have all contributed to the better state of things, and as such developments promise to continue for some time to come, increasing electrical employment may be regarded as a certainty. The occupation of existing works to their full capacity, the extension of production facilities that is reported in various quarters, and the launching of new trading enterprises, are absorbing the services of men who have been either without a job or waiting to better their positions. They will also be providing a larger number of openings for those who are about to complete their training and are wondering what the future holds for them. His Majesty's Jubilee seemed to mark a new starting point for the industry; to-day things generally are well on the move, justifying high anticipations.

The B.I.F. in London

In his speech at the recent I.E.E. Birmingham dinner Sir Edward Crowe, Comptroller of the D.O.T., clarified the position regarding the housing of the London Section of the British Industries Fair. He said that they were looking forward to the completion of the Earl's Court buildings by 1937, when a part of the London Fair would be held there—not the whole of the Section, as some people appeared to think. The new building would be nothing like large enough to accommodate the whole of the exhibits; only those parts previously housed at the White City would be transferred to Earl's Court. Dealing with the Fair as a whole, he said that once again records would be broken in 1936. The competition for the space at the British Industries Fair was one of the encouraging signs of improved conditions for business men.

Cartridge Fuses

The growing demand for low-rated fuses in plug-heads for such light-current applications as radio-receiver circuits, railway signalling and domestic clocks resulted in the production of a number of the small cartridge type. The performance of some of these was erratic and called for some kind of standardisation, and the matter was brought to a head by the recognition in the tenth edition of the I.E.E. Regulations of the use of small fuses in plug-heads, for which standard dimensions were also requisite. The first B.S. Specification to deal entirely with cartridge fuses has now been issued (No. 646-1935, 2s.). This covers ordinary-duty types up to 5 A at 250 V, and is based largely on the results of investigations carried out by the Electrical Research Association. Cartridge fuses will thus be obtainable on a precision rating without any uncertainty of performance thereafter due to attempts at rewiring by the user.

Progress in Radiology

Generally speaking, last week's Radiological Exhibition showed that progress is continuing at a steady pace. The degree of standardisation and stability now attained will increase the confidence of the purchaser, and must benefit the manufacturer. Improvements in control and instrument equipments are very welcome. The provision of a first-class set of instruments, together with stabilised control, is the keynote to accurate pre-determination of factors in diagnostic work; and the purchaser would be wise to recognise this if he desires to obtain improved results, decrease his film bill, and shorten the waiting period of his patient. In the therapy field the importance of accurate dosage is well recognised, and the same remarks apply. The production by British manufacturers of a reliable h.v. distribution system, incorporating a maximum of fixed conductors of minimum capacitance, suitable junctions, and a minimum of rubber insulated flexibles is awaited. We have much to learn from our Continental neighbours so far as this field of electrical science is generally concerned, but no doubt British makers of X-ray equipment make due note of foreign developments.

Little and Good

In the "Electricity Supply" section of this issue we give a brief outline of a development programme prepared by Mr. W. Phœnix, engineer and manager at Newton-in-Makerfield, Lancs., and approved by his Council. Although the undertaking is not large (it purchases and distributes about 5 million kWh annually) it is a "live" one. The immediate aim is to have a main within easy reach of every ratepayer within the next three years. It is satisfactory to learn that there is not to be a rigid insistence on guarantees, which, however necessary, are often a serious impediment to expansion. Another point is that the Council also controls the local gas undertaking, but in spite of this has not restricted the development of either department in favour of the other, as might justifiably have been feared.

"Fixed" Charges

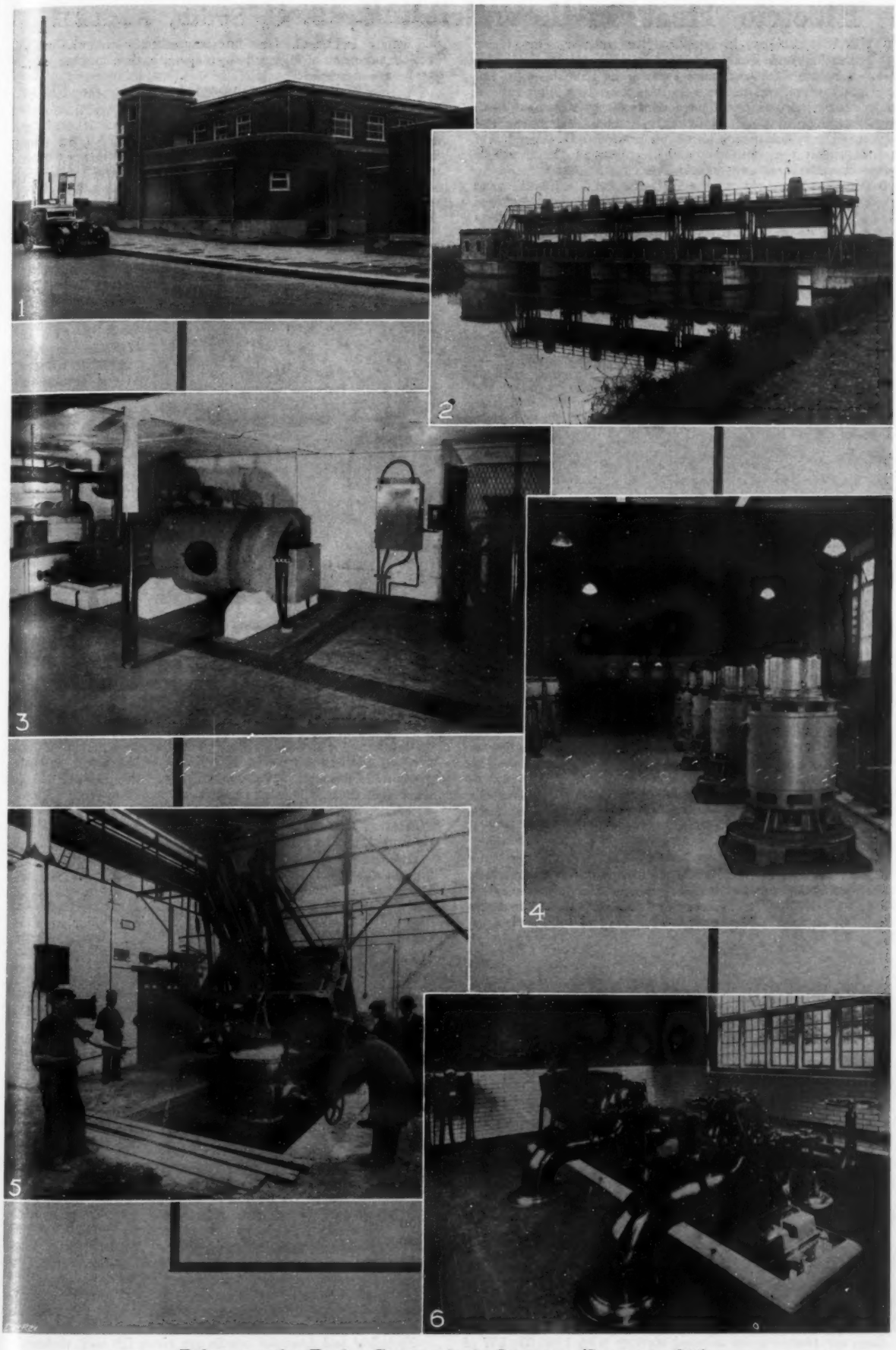
A daily newspaper reports that a number of Uxbridge residents have received notice terminating their electricity agreements owing to an alteration in the rateable value of their premises—generally (as is usual) in an upward direction. This is not the first instance of its kind, but it provides an argument against the employment of the assessment of a house as a basis for the fixed charge of an electricity tariff. If the supply authority has found that it can profitably sell electricity at a certain rate it has no justification for raising the rate because of an increased assessment. The consumer naturally objects: not only is he presented with an increased rate demand, but he is expected to pay more for his electricity—and probably water—as well. In our view a fixed charge should remain fixed unless the supply authority discovers that it is uneconomical.

The Value of Convenience

The fallacy of discussing the value of electrical service in terms of so much per unit, irrespective of other considerations, is illustrated by the widespread use of the primary battery, in spite of the high cost of obtaining energy from that source. Major L. H. Peter, at the I.E.E. last week, gave the figure of 15s. per kWh, which is found to be reasonably practicable for operating railway-point and signal mechanisms. The work is, of course, intermittent and of short duration, but this extreme instance will serve as an example of the high convenience value of electricity in most applications.

Transformer Regulation

The view that a transformer working at a poor load factor should have as low an iron loss as possible is subject to several qualifications. One is that this characteristic implies a relatively large copper loss, which in addition to being usually a peak-load results in poor regulation. The last-named consideration may have an economic bearing that is of greater importance than the loss of watts in the transformer itself. Mr. F. S. Naylor, at the I.E.E. Transmission Section on Wednesday, quoted a case in which, at a load factor of only fifteen per cent., the installation of a transformer was justified on account of the saving in revenue effected by maintaining voltage at consumers' terminals, although the iron losses were double and the total losses more than one-third above those of another design which was offered at the same price. On technical grounds alone the second transformer would have been chosen.



Points on the Derby Corporation's System. **(See page 811)**

1. A sub-station with display window and inquiry office. 2. Electrically controlled sluice gates in a reclamation scheme. 3. A 100-kW immersion heater boiler at the Art Gallery. 4. Some of the plant at the Spondon sewage works. 5. A 30-cwt. 800-kVA steel casting arc furnace. 6. Two-unit pumping equipment at Little Eaton

Electric Heat in Laundries. By F. C. Smith, A.M.I.E.E.

HEAT is required in laundries for steam raising, water heating and ironing. Electrically heated drag irons, machine float irons and hand irons have been in use for many years, but in large laundries where a high rate of output must be maintained complaints of slowness have been registered against them, particularly against hand irons. The speed with which ironing can be carried out depends, of course, upon the dampness and thickness of the materials treated, and the cooling effect of thick wet materials on an electric iron certainly is great. It has been stated that an ordinary flex-connected laundry iron in the hands of a skilled operative produces about 20 per cent. less work in a day than do some of its fuel-heated competitors. This is a factor which sometimes weighs against the adoption of electric irons, but at the same time most laundries prefer to use them.

The cordless iron permits a far higher rate of working and also eliminates the possibility of trouble due to flex failures. Each operator has two irons and a stand, the irons being used alternately and plugged into sockets when placed upon the stand for reheating.

Steam Raising

Hot water can be produced by direct electric heating and large storage cylinders under controlled or unrestricted load, or, alternatively, it can be produced by a steam-heated calorifier or direct injection. Electric boilers are available for raising steam, although at the rates prevailing in this country it is not suggested that all large laundries can afford to adopt them. Nevertheless many of the so called hand-laundries and those attached to institutions have found that a dependable economic service is obtainable from them.

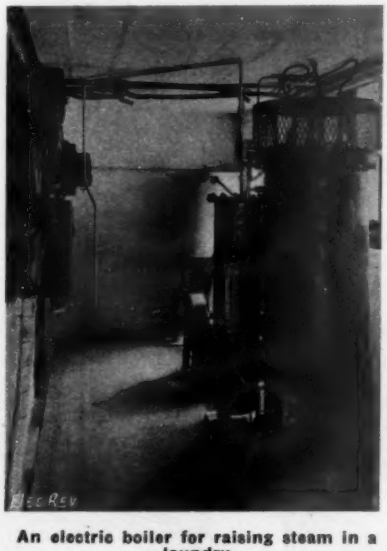
The cost of steam, including labour but excluding maintenance charges on the boiler house, is about 2s. per 1,000 lb. in large laundries using good solid fuel, rising to about 5s. 6d. in small establishments. The cost of a similar quantity of steam at ¼d. per kWh is about 7s. Hence an electric steam boiler has little chance of being considered on comparative fuel cost alone and must offer definite attractions in other directions. A considerable advantage is economy in space. A fuel-fired boiler having an evaporative capacity of, say, 1,000 lb. per hour with fuel storage would require a floor area (for cleanliness a separate building) of about 200 sq. ft., while a low-voltage electric boiler with the same output requires about 36 sq. ft., including switchgear, and does not require a separate building.

Another factor, of perhaps greater importance, is a knowledge of the total quantity of heat used. While most laundries know their maximum demand for steam and, in the case of existing plant, their annual solid fuel bill, few realise the actual quantity of steam used and very few what part of the total fuel bill should be allocated to banking or what is used in excess of actual steam requirements.

At times of light load there is, with intelligent stoking, some slight reduction in fuel consumption, but with an automatic electrode boiler the electrical load curve follows almost exactly the steam output curve. Because of this any attempt to assess probable consumption of energy on a basis of solid fuel is apt to be misleading.

The peculiarities of the laundry business are such that no accurate cost of treating each article can be ascertained; at the moment only the gross cost of washing, drying and ironing a quantity of articles of different sizes (sheets, shirts, cloths and collars) is known. The only way of estimating the probable consumption of energy is to use as a basis a number, say, per thousand articles.

Whether the hot water is obtained from a separate storage cylinder or by use of a steam boiler, the cost will be much the same, assuming that no special off-peak rate is used for hot water supply. The approximate number of kWh consumed as heat per 1,000 articles depends, of course, upon whether the washing plant is used to capacity and efficiently, but the following figures are representative: steam 300 kWh, hot water 230 kWh, and ironing 30 kWh. Thus the approximate consumption per article is about 0.6 kWh.



An electric boiler for raising steam in a laundry

Electrode boilers are best suited to laundry work because of their flexibility and the smooth speed with which the input of energy can be regulated and the wide limits of regulation with simple controls. Because of the fluctuating load, boilers with large steam space and electrode area are best suited to this type of work.

The automatic controls on steam boilers used for laundry work must be capable of controlling both pressure and load, for when steam is admitted to a washer the pressure drops rapidly. The load, or electrical input, must then be automatically raised in order that the steam supply and pressure shall be adequate for the needs of other pieces of plant.

When washers are not in use relatively little steam at high pressure is required. Washers are used intermittently; thus when this demand is off the boiler pressure may cause a blow-off of steam from the safety valve. This is a direct rejection of heating units and, in the interests of economy, should be prevented.

The accompanying illustration shows a G.E.C. boiler operating on the Penzold system supplying steam to a laundry. Waste of heat by blow-off is prevented by blowing-off water from the lower part of the boiler into a pressure cylinder. The boiler feed pump is connected to this cylinder, so that the hot water forced out of the boiler is fed back again and the sensible heat of the water is thus saved. Not only does the expulsion of water from the boiler relieve pressure, but it reduces the wetted area of electrode and therefore the electrical input.

Electricity Supply in London and Home Counties

THE eighth General Review of Statistics relating to electricity supply undertakings in its district has been published by the London and Home Counties Joint Electricity Authority at 5s. In form the new issue, which covers the year ended March 31st, 1934, for municipalities, and December 31st, 1933, for companies, follows generally the arrangement adopted in its predecessors.

The frontispiece consists of a map indicating by different colours the areas of the undertakings in the district, which extends roughly from Hertford and St. Albans in the north to Dorking and Reigate in the south and from Windsor eastwards to Gravesend.

The area includes eighty-three authorised undertakings (forty-four municipal), of which thirty are in London. Fifty-nine generating stations were in operation with an installed capacity of 2,720,000 kW (716,000 kW municipal). Included in these are twenty-seven selected stations with 1,985,000 kW of plant. Maximum load, excluding bulk supplies purchased, reached 1,215,742 kW (352,000 municipal). Connections totalled 4,897,000 kW.

The kWh generated was 12.5 per cent. more than in 1932-33 and aggregated 3,803 million (1,239 million by municipalities), of which 8.3 per cent. was generated under the C.E.B.; 79 per cent. came from stations having more than 60,000 kW installed. In addition 1,013 million kWh was generated by three railway companies and the London Passenger Transport Board (781 million) not included in the Return.

Consumption per head of population was 418 kWh and, including the transport authorities mentioned, it was 540 kWh, but no particulars are available regarding private generation. Capital expenditure totalled £121 million (£43 million municipal). Revenue per kWh sold was for lighting, heating and cooking 2.21d., for power 0.89d., public lighting 1.13d., traction 0.47d., and bulk 0.48d. The average price for separately metered domestic supplies was: Lighting 3.3d., heating and cooking 0.89d.; for lighting, heating and cooking supplies combined it was 1.57d. Working costs came to 0.64d. per kWh for local authorities and 0.47d. for companies.

Technical and financial details are given for each undertaking in a section of 135 pages, and the schedule of tariffs at January 1st, 1935, which was issued separately early this year, is also included. Another section gives particulars of the statutory powers and areas of supply for every undertaking under the Authority's supervision.

Load Building at Derby

An active municipal electricity department

WE should say that the load at Derby is a good mixture. Individual consumptions range from the 50 kWh per year taken by the smallest lighting-only installation to up to twelve million kWh per annum sold to the undertaking's largest consumer—Messrs. Rolls-Royce, Ltd. Last year the total output was 55¼ million kWh, the maximum demand was 20,830 kW and the load factor was 35.6 per cent. In round figures the energy sales may be classified as: industrial, 24.6 million kWh; domestic, 14 million kWh; commercial; 10.4 million kWh; traction 4.8 million kWh, and public lighting, 1.7 million kWh. Further, we may put urban sales at 50.2 million kWh; and rural sales at 5.3 million kWh.

But we are more concerned with the outlook of Mr. F. Nicholls, borough electrical engineer, and his staff in respect of the possibilities of load building in the future. We heard it said "at present at any rate we welcome all the load we can get, irrespective of class," and this, coupled with the condemnation by Mr. A. P. Hayes (mains superintendent) of the domestic cooker and water heater change-over switch as not being compatible with the "abundant supply of electricity" idea, represents the attitude which must be adopted generally throughout the country if the planned objectives are to be attained.

Although Derby has won nearly all the motive-power load that it is possible to get, those responsible are obviously not content to leave it at that, for we saw a few new installations which certainly suggest enterprise and initiative. At the Little Eaton pumping station the engineer has been won over and an electrical pumping installation has replaced some good examples of the beam engine of over half a century ago. Two electrically driven centrifugal pump units supplied by Messrs. Mather & Platt, Ltd., each deal with four million gallons of water per day pumping from a gravitation reservoir to a higher store with two levels of independent supply systems.

In the lower-service unit a single-chamber pump is designed for a head of 170 ft., while in the other equipment two similar pumps in series serve a 300-ft. head. The main pump of the combination unit is a duplicate of the lower-service pump, so that by disengaging the coupling the separated pump is available for the lower-service work in emergency. The wound-rotor induction motors are of 200 and 335 h.p. respectively (1,480 r.p.m.) and drive through flexible couplings. At the Spondon sewage works we saw in a subsidiary pumping station five 27½-h.p. vertical-spindle pumps with push-button control, *via* contactor starters (B.T.H.), both locally and remotely from the main station, where about 180 h.p. of steam plant remains to be converted.

Some recently erected filter beds at these works are of the longitudinal electrically driven type. At the regulating barrage across the river Derwent by-pass stream of the Land Reclamation Scheme we saw one more example of good public electrical service. Each of the five Ransomes and Rapier sluice gates is operated by a 3-h.p. motor situated overhead, and the gates are separately float controlled so that they operate in sequence for both opening and closing.

The total connected motor load is 18,300 kW. A fair amount of welding load has been secured in at least nine works in the town and some recently installed furnaces have provided a further considerable demand. The new Stobie arc furnace at the works of Qualcast, Ltd., is used for steel casting and has 30-cwt. capacity and is loaded at 800 kVA. It is served by a G.E.C. transformer and Reyrolle h.p. switchgear, with automatic control by Watford Engineering apparatus. A 3-phase 6,600-V feeder was run direct from the generating station to the Company's works for this new arc furnace. There is about 500 kW of furnace load at the Rolls-Royce works, mostly for heat-treatment work, and accuracy of control, we were told, has been the principal means of securing this load.

A favourable tariff with a running charge of ½d. per kWh has brought in some encouraging non-domestic space-heating work. In the local Co-operative stores and the Kardomah Café there are 50-kW and 40-kW tubular heating installations, respectively, while at the Public Library and Art Gallery a 100-kW Bastian & Allen immersion-heater boiler (400 gall.) has ousted coke-fired equipment and is giving every satisfac-

A fleet of electric vehicles belonging to the Derby Co-operative Society

A 650-yard length of cable being laid across the Derwent (*Derby Daily Telegraph*)

tion in its service to the existing hot-water range. The equipment is thermostatically controlled and a circulating pump forces the water round the installation.

Thanks to a night-charging flat rate of ½d. per kWh there are already well over 100 electric vehicles in use in Derby, ninety of which are employed by the Derby Co-operative Society, which is very satisfied with their economical and satisfactory service. Sixty-eight of these vehicles are used for milk delivery and are of Morrison manufacture, and the others are employed for bagged coal and fruit delivery. They are charged at the depôt by Westinghouse metal rectifiers.

The importance of the public-lighting load is obviously not overlooked, for we learnt that the remaining 1,000 gas lamps in the town are to be converted within the next two years. In all there are about 4,000 electric street lamps varying in size from 100 W to 1,000 W. A scheme of step switching by Brookhirst relays in which the first section is directly switched from the power station and a relay at the end of each section operates the controlling switch for the next section, embraces about twenty miles of main road lighting with about 1,000 lamps. Gasfilled lamps are used practically throughout, and Revo "Magnalite" (multiple facet) fittings and concrete poles feature largely in the scheme. One section of main road is at present experimentally lighted by "Mercra" electric-discharge lamps made by the B.T.H. Co., Ltd.

A typical rural sub-station (Allestree)

An item of news relating to the recently installed lighting at the village of Allestree is most encouraging. The service was won by the undertaking after very severe competition from the gas supply. In the presence of representatives of electricity, gas, and the Council representative comparative tests were made as a result of a challenge by the gas company.

Measurements were made with a Weston "Photronic" cell photometer and a Holophane visual instrument (after 90 ft.) at 10-ft. intervals from the lighting units in a straight line along the pavement, while on a line 27 ft. from the first test line and parallel to it other tests were taken.

Every electrical test figure exceeded the corresponding gas value, and in some cases represented more than double the lighting. The line readings varied from 1.2 ft.-candles at 10 ft. to 0.075 ft.-candles at 90 ft. in the case of the electrical fitting, and from 0.9 ft.-candles at 10 ft. to 0.35 ft.-candles at 90 ft. for the gas fitting. As the result of these tests seventy-five Revo fittings of the type referred to were installed and an extension of fourteen more lamps has just been decided upon An order has also been secured for fifty similar fittings at Little Eaton.

While the late-hour shop-window lighting tariff of 2d. per kWh has resulted in excellent business, we understand that there is a tendency for the bigger shops to change over to the undertaking's business tariff, which for all classes of supply embraces a fixed charge of £10 per year per kW of lighting and a running charge of ½d. per kWh. With proper power-factor correction neon signs are encouraged as being quite good load builders.

Assisted Wiring

On the domestic side the assisted-wiring scheme is the biggest plank in lighting development work. Since 1931 11,600 houses have been wired under this scheme, and we learn that the remaining 6,000 non-electric houses in Derby represent only about 12 per cent. of the whole. These are being taken on at the rate of about 100 per month, but this rate of development is being gradually reduced with the narrowing field. Most of these 6,000 houses are of the smallest and oldest type, and many are due for demolition.

The undertaking is in line with the country generally in not having yet come to any definite conclusion or plan of campaign with regard to space heating, and we should like to think that although the Electricity Department has no reason to be dissatisfied with the use that is made of the 20,000 or so radiators at present connected, the vast majority of them were not being used merely for supplementary heating with consequences for which the industry as a whole must inevitably suffer later on. However, the maintained rate of connection for new radiators of over 2,000 per year represents a considerable increase in load. It is interesting here to note that in connection with a new municipal housing estate about to be constructed, comprising as a first instalment about 500 houses, orders have been received by the Electricity Department to install inset wall fires in the bedrooms of every house in addition to lighting and electric wash boilers.

Domestic Cooking and Water Heating

It is in the domestic cooking field that the biggest load-building efforts are made, and the new demonstration hall which was described and illustrated in the ELECTRICAL REVIEW of November 22nd is ample evidence of this. As a rule about 180 prospective and existing consumers attend the weekly demonstrations which, together with canvassing, local advertising, and excellent service to keep existing consumers satisfied, has resulted in a gradually increasing rate at which new connections are made; at present it is about 70 cookers per week. The total out now is 6,350.

Mr. Huliston, commercial assistant, told us that every fault is attended to on the day it is reported. We learnt that in the cooker repair shop 1,000 cookers were dealt with last year for repairs ranging from simple element replacements to complete overhauls, and of these 500 cookers were reconditioned and stove enamelled. Of course, the hiring charge of 4s. per quarter for 4- to 5-person Jackson and Creda cookers plays an important part in this development work and so does the two-part tariff, with its quarterly standing charge of 2½ per cent. of the rateable assessment and a running charge of ½d. per kWh.

There are over 600 consumers on a special agreement prepayment meter and fixed charge collector system by which all hiring and installation charges are automatically collected by the meter on a weekly basis in addition to ½d. per kWh for the energy consumed. In a somewhat similar scheme for municipal houses the fixed charges are collected from the tenants by the Estates Department with the rent.

There is a good showing too in the water-heating field, with about 1,500 heaters of all sorts now out on hire and new connections being made at the rate of 50 per month. By far the majority of these are conversion jobs most of which employ Santon "Circstat" immersion circulators fixed and wired free with a charge of 3s. per quarter, including an insulating jacket for the tank. Up to 15-gall. self-contained water heaters are included in the apparatus hired out, but the ½-gall. equipment is the most popular.

October 1st saw the initiation of a simple hiring scheme for wash-boilers, and up to November 13th 191 enquipments had been installed. Ten-gallon 3-kW "Burco" boilers are employed and the hiring charge is 2s. 6d. per quarter. While, as we have already indicated, use is not restricted by a change-over switch, evidently the undertaking's eye is on the "washing day is cold-dinner day" possibilities, for the scheme is restricted to cooking consumers.

The Cable System

A vital question in any progressive undertaking is, how the rapid growth of load is to be catered for. At Derby they are relying upon the extreme flexibility of the single-phase secondary system at 4,000/2,000 V fed from the 6,600-V primary ring-main system by Scott-connected transformers, and Mr. Hayes obviously thinks in terms of a h.p. network rather than a l.p. one. The scheme renders it a simple matter to correct pressure at almost any point by the addition of a kiosk in which is housed a Berry single-phase transformer.

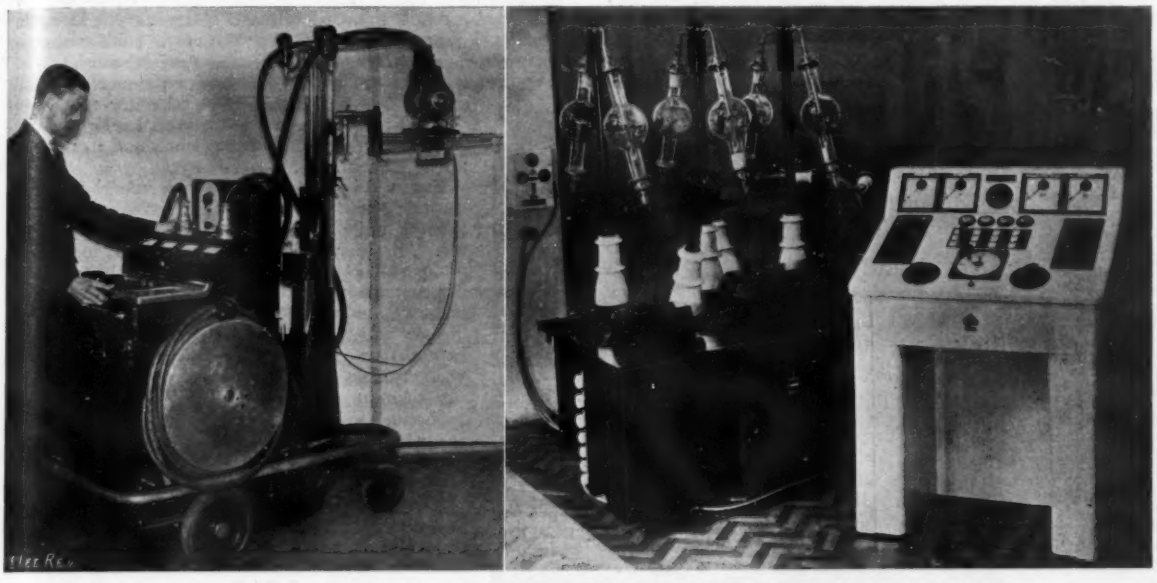
The system of radial e.h.p. feeders out to the ring-main is repeated in the rural districts where 4,000-V or 2,000-V mains radiate out in most cases direct to farms, again illustrating the undertaking's disbelief in widespread l.p. distribution. Most industrial consumers are supplied with 3-phase current direct, but there are many single-phase motors of up to 10 h.p. running successfully. The undertaking has in mind increasing the ring-main pressure to 33 kV at a later date, and the system of extensions is designed to that end. An unusual cable-laying job was recently completed when 650 yards of 0.3 sq. in., 11,000 V., p.i.l.c., d.w.a. cable in one length was laid on the bed of the Derwent. It was supplied by Derby Cables, Ltd. A further example of the Department's enterprise is the equipping of a sub-station in the heart of the new Civic Centre in Corporation Street with a permanent display window and inquiry office where on market days prospective existing rural consumers can call when the adjacent markets and bus station bring them to the locality.

The Radiological Exhibition.

By C. Morgan Davies, A.M.I.E.E.

Recent progress in X-ray apparatus

IT was not anticipated that this year's exhibition of X-ray apparatus in London (December 4th to 6th) in connection with the annual Congress of the Institute of Radiology would reveal any startling developments or radical changes in design. Apart from the inclusion of one or two pieces of equipment for highly specialised requirements, the general trend of development is concerned with improvements in detail. We are now enjoying the predicted period of stability consequent upon the successful applications of methods intended to guard against shock and stray radiation, the design of h.v. units having become largely standardised. Listed units for diagnostic purposes may now be classified as follows:—high power, units having outputs from 26 kVA upwards; medium power, from 10 to 26 kVA; low power, from 1.9 to 10 kVA; miniature, under 1.9 kVA; and condenser discharge equipments for high-speed chest radiography.



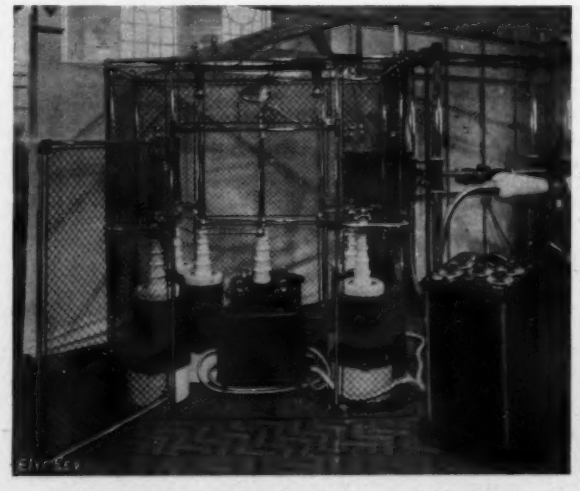
Left: A mobile X-ray unit by A. E. Dean. Right: The "Tridoros" equipment (G.R.S.A.)

It is not possible to judge the performance of units entirely by their electrical ratings. Some of those in the low-power class have been specially developed in conjunction with tubes having grid or restricted cathode action, the current impulse being confined to the high values of the voltage impulse. In these cases the X-ray output is high, relative to the mean anode current, provided the transformer regulation is good. Equipment developed upon these lines was exhibited upon the stand of Watson & Sons (Electro-Medical), Ltd. Transformer regulation has been much improved of recent years, and the maximum voltages are now limited to 120 kVp for purely diagnostic purposes.

Most of the manufacturers are now incorporating stabilisers to steady the voltage applied to the filament transformers. It is well known that a small variation of filament voltage, consequent upon fluctuations in the main supply, causes a large variation in tube current. This makes the accurate predetermination of the quantity factor impossible, assuming the time switch to be accurate. Rectifying valves, if properly adjusted, are less sensitive to this trouble than the X-ray tube, and it should be mentioned that the gas-filled valve exhibited by Messrs. Philips is virtually independent of variations of filament voltage. Improvements in the ganging and grouping of controls were noted, also the tendency to oil-immerse the main primary contactors. This component imposes limitations where very short exposures are concerned, due to inertia and remanent magnetism. The oil-immersed contactor now fitted by Schall & Son is electro-magnetically operated on closing and opening, giving a definite positive pull in each case.

It is hardly necessary to emphasise the advantage gained by being able to carry out all operations from the control desk. The "Tridoros" shown on the stand of the General Radiological and Surgical Apparatus Co., Ltd., is the first apparatus which I have seen to offer this facility. The equipment is designed to operate on normal three-phase mains, incorporates a six-valve rectifier, and belongs to the high power class (1,000 mA at 75 kVp, max. 100 kVp). It is suitable for connecting to any one of four X-ray tubes through the medium of an oil-immersed h.v. solenoid-operated switch, controlled from a panel on the centre of the switch table. Operations may be "normal" or "automatic," according to the position of a technique selector. In the former case the required tube is selected by insertion of a plug and selection of operating factors proceeds in the ordinary way. In the latter case selection of a specified and stabilised tube current occurs automatically on the required tube, by insertion of the plug into the appropriate sockets, three settings being available for each tube.

Operation of the technique selector also changes over the shunts and movements of a combined mA and mA secs. meter, selects the required time switch range, and adjusts the saturation points of the rectifying valves, all in accordance with the radiographic requirement. All filament voltages are governed by a static stabiliser, and penetration selection (kV) is through the medium of remotely controlled motor-driven gear which gives an infinite degree of variation.



The Schall super-stabilised 4-valve X-ray unit

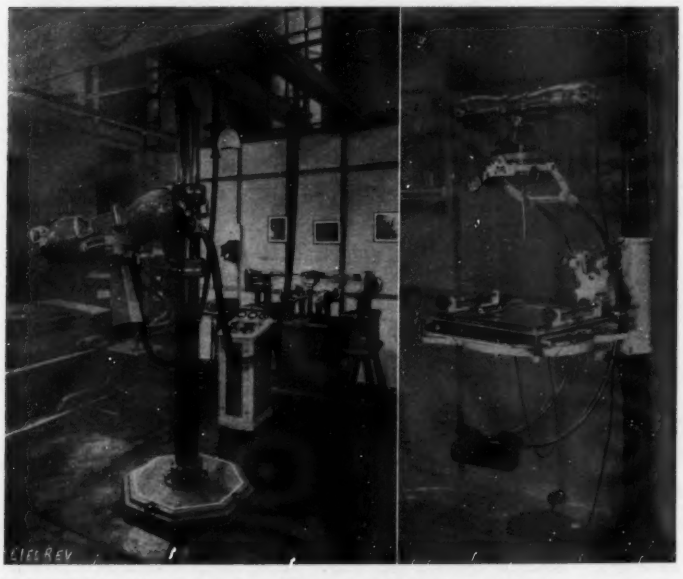
Messrs. Schall & Son exhibited two new model machines of the four- and single-valve types respectively. The special features of these are the stabilisation of all filament supplies and adjustable compensation of the pre-reading kV meter so that it indicates the correct tube kVp at varying transformer loads. The filament transformer primary voltmeter is also fitted with an adjustable compensator designed to adjust the readings of the instrument for differences between the resistances of different tube filaments. These components are intended to avoid the necessity of referring to calibration charts when selecting factors.

The Solus Co., Ltd., exhibited a four-valve unit built in an all-metal cabinet, the upper part of this housing a motor-driven h.v. air-insulated tube-selector switch. The positions of the latter are selected from the control desk. All necessary circuits

are stabilised, including the condenser operated time switch. This unit is rated at 26 kVA and is generally similar to the previous model.

All the manufacturers are producing low power h.v. units, a newcomer to this field being the Westinghouse equipment seen on the stand of the Medical Supply Association, Ltd. The apparatus inspected was built on the "unit" system in conjunction with an examination equipment known as the "Fluoradex," and incorporating a Westinghouse oil-immersed tube. The radiographic circuit is operated up to 60 mA at 88 kVp, a separate tube and transformer being provided for screening purposes. A complete range of equipment is available. Messrs. Stanley Cox & Co. exhibited a new model unit rated at 30 mA, 90 kVp. This unit incorporates a mains-voltage adjuster and a ganged selector, providing eight settings of current and kilovoltage combined. The addition of 5 kV may be applied to any setting by operation of an auxiliary switch, thus providing sixteen selections. The set operates in conjunction with a restricted cathode "Metalix" tube.

Mobile units of the low power type were exhibited by Messrs. Newton & Wright, Ltd., and A. E. Dean & Co. The machine shown by the latter is known as the "K.C.H." mobile unit,



Left: The Westinghouse deep-therapy tube-stand and "Duocondex" generator (M.S.A.). Right: Lysholm precision skull apparatus (Watson & Sons)

and has been developed with a special tube column, designed to carry a double focus tube, and suitable for taking radiographs up to 6 ft. film/focus distance over a bed. The maximum height of the column when passing through doorways is 6 ft. 3 in., although the vertical travel of the tube may be 8 ft. The transformer is rated at 100 mA, 90 kVp, the exposure time being controlled by a Dean synchronous timer. Messrs. Dean also exhibited a range of valve rectifier equipment and examination apparatus.

The miniature units displayed last year were again exhibited. A newcomer to this class is the "Rapidex" seen on the stand of Mr. Cuthbert Andrews. This unit consists of a transforming set and a special "Protexray" X-ray tube oil immersed in a small tank. It is rated at 15 mA, 77 kVp, and is suitable for mounting in a variety of ways. Messrs. F. R. Butt & Co. exhibited a light mobile unit rated at 14 mA, 64 kVp, along with a representative selection of their products.

The tilting couch is now the most favoured examination equipment for all-round work. Messrs. Newton & Wright, Ltd., exhibited a good example of this type of apparatus fitted with independent motor-driven movements on two axes at right angles. One movement enables the patient to be tilted from the vertical to a position below the horizontal, the other providing rotation around his long axis. The motors are controlled by a four-pedal foot switch, the pedals being illuminated by hooded neon lights to facilitate operations in darkness. An automatic device for taking stereoscopic films was also shown. This is solenoid operated, the casette changing gear and time switch resetter being similarly controlled so as to synchronise movements. The Victor X-ray Corporation exhibited a motor-driven couch in conjunction with a control desk. Operations may be carried out by means of a single foot switch, change over from screening to radiographic factors or *vice versa* being made by the movement of a simple lever attached to the fluorescent screen holder.

Refinements noted in connection with therapy equipment were the provision of solenoid operated tube shutters, improved methods of measurement and control of dosage factors, and increase of ray output efficiency. The Watson superficial therapy unit operates between 55 and 95 kVp and incorporates synchronous driven timing gear which gives an audible signal at the expiration of the set period.

Contact therapy is a subject receiving much attention to-day. An apparatus designed for the application of localised irradiation in cavities of the body, after the method of Professor Chaoul, was seen on the stand of the G.R.S.A., Ltd. This is designed for excitation by a constant potential unit operating at up to 60 kV with the anode at earth potential, cooling being effected by direct connection to the main water supply.

In the field of measurement there were two important additions. The Siemens "Culmimeter" provides a means of direct indication of the peak value of the tube voltage on an instrument mounted on the control desk. This is accomplished by utilising a special high resistance potentiometer directly connected across the h.v. circuit and centre tapped to earth. Fractional taps are taken off near the earth point and connected to the measuring and indicating devices, consisting of a rectifying valve, condenser, discharge resistance, and kV meter. The instrument is suitable for the range from 50 to 250 kV, constant potential ±15 per cent. An instrument for indicating the dosage rate in r units per min. was also inspected.

Messrs. Victor displayed a new model standard control panel for constant or pulsating voltage therapy units within the range from 200 to 400 kV. All operations are carried out by means of push-button control, including the opening and closing of the tube shutter. The instrument equipment incorporates a "constancy" indicator which indicates the percentage variation in radiation output, the ionisation chamber in connection therewith being permanently accommodated in the master cone of the X-ray tube.

The new Westinghouse "Duocondex" apparatus, which utilises the Villard circuit, was displayed complete with X-ray tube and stand. Anode cooling is obtained by means of forced circulation of oil, this being again cooled by passing through a radiator supplied from the water main. The apparatus is rated at 25 mA, 200 kVp. Messrs. Schall & Son's new deep therapy cooling pump is housed inside a cylindrical radiator built to operate at pressure and incorporates suitable protective devices. It is interesting to note that Messrs. Schall report that the 10 mA at 200 kV copper-oxide rectifier exhibited last year is operating satisfactorily, and that a 400-kV unit has been installed.

Mr. Cuthbert Andrews has produced an air-insulated shield of smaller dimensions, while Messrs. Schall's new diagnostic shield is also reduced in size and provides for rotation of the centre member and insert tube independent of the shield proper. Philips have produced a gas-filled rectifying valve with additional condenser distribution stages, making it suitable for operation up to 160 kV reverse voltage. A complete range of tubes was seen on the Philips stand covering all diagnostic requirements and therapy needs from 12 to 400 kV. The Victor organisation continues its range of all oil-immersed models; the G.R.S.A., Ltd., utilises remote air blowers for its diagnostic models and forced oil circulation for the therapy tubes.

This year's show marked the introduction of two interesting developments in specialised fields. Messrs. Watson & Sons gave a special demonstration at their Kingsway showrooms of the ciné-radiographic apparatus mentioned on page 822.

The second development refers to the exhibition of radiographs showing selected layers or sections of the human body, exhibited by Messrs. Watson & Sons and G.R.S.A., Ltd.

The valve oscillator appears to be making good headway in the field of diathermy. Representative equipments were shown by Messrs. Marconi, G.R.S.A., Ltd., Stanley Cox, and the Victor X-ray Corporation. The model exhibited by the last named company utilises an inductor field for application in place of the usual condenser method. Wavelengths of 6 and 30 metres are employed. For light therapy there was the new electronic discharge tube the characteristics of which have already been described (Dr. J. Tutin, ELEC. REV., February 1st, 1935).

Cardiologists are well catered for, judging by the number of cardiographs seen. The Solus concern exhibited a new instrument in the form of the Cossor-Robertson portable instrument, which utilises a cathode-ray tube and is suitable for working off a.c. or d.c. mains or from a 12-V battery. Mr. Cuthbert Andrews has embarked upon the manufacture of cathode-ray tubes, one of which was exhibited in a Tinsley h.v. oscillograph.

Heating and Ventilation. By E. M. Ackery

A book comparing various methods

THE publication of a three-volume (780 pp.) book entitled "Modern Heating and Ventilation," edited by A. A. Jones, by the Caxton Publishing Co., Ltd., marks a definite step in the progress of electric heating, which may now be said to have been officially adopted by the heating industry. It is rather remarkable that the publication should almost coincide with the presentation before a sessional meeting of the Institution of Heating and Ventilating Engineers of one of the rare papers on electric heating.

To the electrical engineer the most interesting chapters are those on "Methods of Heating," by W. W. Nobbs; "Gas Heating," by E. L. Oughton; and "Electric Heating," by John F. Stanley. The chapter on methods of heating does not, as might be assumed from the title, deal with the most suitable method for heating various buildings, but is almost entirely a comparison of the relative cost of heating with various fuels. Two examples are given, a private house, where for the central heating six radiators are required, and a larger office building with a maximum heat loss of 1,000,000 B.th.u. per hour. For the private house the cost ratio for fuel plus labour, capital cost being omitted, is:—

Agent.	Cost per day.	Ratio.
	d.	
Coke-fired boiler. 40/- per ton	30	1.0
Open coal grate. 60/- per ton	70	3.3
Anthracite stove. 75/- per ton	36	1.2
Gas fires. 8.6d. per therm	65	2.16
Electric fires. 1d. per kWh.	109	3.63

Labour is charged at a nominal figure of 1/- per hour.

The choice of 1d. per kWh for electricity is unfortunate, as most domestic heating is done at ¾d. or ½d., but the most serious mistake is the assumption that in a house of this description all six rooms will be heated all day long and that the quantities of fuel used, as compared with the coke boiler, are directly proportional to the respective efficiencies of combustion and apparatus, with no allowance for banking losses at night. The whole point that both electric and gas fires are highly suitable for domestic work because the heat requirements are intermittent is missed. Central heating and heating by fires of any description are so different in character as to make such cost comparisons quite valueless.

The cost comparison for the office building takes into account fuel, labour, power for auxiliaries, capital charges and maintenance, and makes a distinction between convection heating and panel heating.

The author has assumed that all systems will be banked, or the equivalent, during nights and week-ends, but he makes the unfounded assumption that the loss of efficiency through banking is the same for each, thus ignoring one of the main factors that makes electric heating particularly suitable for intermittently heated buildings such as offices. He complicates the issue by calling his final comparison table a summary of relative annual costs for *continuous* warming of an office building. All this tends to confuse the reader, and as his costs for panel heating are lower than for convection heating one is left in doubt as to whether this applies to really continuous heating or to intermittent heating. Most heating engineers will agree with the former, but not with the latter.

The whole point is that hot-water panel-heating systems cannot be shut off at night in offices and similar buildings if satisfactory heating is to be obtained. This calls for little comment when coke is the universal fuel, as the difference in fuel consumption between banked boilers and boilers running on average load is small. When, however, an electric thermal-storage system is used heat can be shut off at night, and the difference is between average load and no load at all—a very different state of affairs that is not generally appreciated.

In my opinion, Mr. Nobbs does not do justice to electric thermal storage when he gives it an overall efficiency of 77½ per cent. as compared with hand-fired coke at 47½ per cent. One surprising statement made in this chapter is that a typical mechanical stoker plant burns coke at 40s. per ton. Surely the chief point of the mechanical stoker is to enable cheap, low-grade fuel to be used? The conclusions quoted are not backed by actual results, and the analysis is incomplete. Mr. Oughton has contributed a very useful, complete and well-balanced chapter on gas heating. Starting with a modest statement that "the steady advance of gas as a fuel for heating makes it necessary that heating and ventilating engineers should be acquainted with it," he carries on with combustion, legal terms, meters, gas fires, radiators, hot-water supplies, central heating and steam boilers.

In dealing with radiators of the flueless type he states that the design of the radiator ensures perfect combustion and an absence of condensation. This means apparently that the water vapour is not condensed in the radiator and must therefore pass into the room, where, under certain conditions, it will cause a nuisance. Automatic lighting of gas fires, which is now being so widely advertised, is mentioned, but not described in detail, a disappointing omission. A full description of a gas "immersion" indirect water heater is given. It is apparently flueless and has a maximum gas consumption of 10 cu. ft. per hr., raising from three to four gal. of water per hour to 140 deg. F.

In central heating a newcomer, the gas-fired "unit heater," is of interest. It consists of a battery of flue-ways under which luminous burners are fixed. A motor-driven fan blows air over the tubes, whilst the products of combustion pass through the flues and are discharged through a main flue to the outside.

The most interesting of the central-heating boilers is the "Vesta," for which an efficiency of 90 per cent. is claimed. In this boiler a constant supply of air and gas is atomised and mixed and a limited supply of air is admitted to com-

A loudspeaker in the showroom window of the Fulham Electricity Department (left) reproduces the lecture which is being given to a small audience inside the showrooms (right) and invites passers-by to step inside and witness a cooking demonstration. This method of attracting public attention to the merits of electric cooking is proving most successful

plete combustion under induced draught. Combustion takes place in a chamber of refractory material, and complete combustion is attained before the gases come into contact with any of the water-backed surfaces. An electrically driven induced-draught fan is fitted.

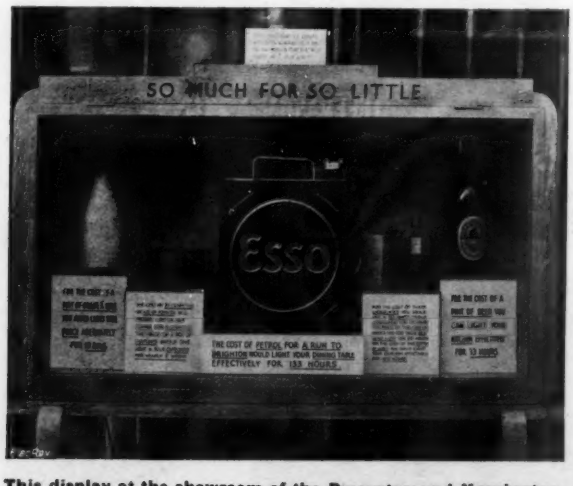
A particularly interesting point, illustrating the thoroughness with which gas engineers are tackling heating problems, is the recommendation that proper heat-loss calculations should be made even when estimating the size of gas fires to be installed. This is definitely a step in the right direction.

The Electrical Method

Mr. Stanley is not so modest as Mr. Oughton; he boldly states that the advantages of electric heating over other systems are greater to-day than they were a few years ago. So far so good. The advantages of electric heating do not call for modesty, but he is on insecure ground when he states that electricity for continuous heating is meeting with considerable success. If this statement is meant to apply to the heating of buildings occupied during the day it is undoubtedly correct, but it is then intermittent and not continuous heating. It should be very clearly understood that electricity is least suited to the building heated twenty-four hours a day, and few installations of this character have been installed. Office and similar buildings need only intermittent heating, and herein lies the secret of the popularity of electric heating for this class of building.

So much for the present; but when we are dealing with the future the statement that " so far as large buildings and offices are concerned electric heating is *the* system of the future " is not likely to receive much support from the supply industry. It is generally agreed that for large buildings low off-peak rates are necessary to compete with other fuels, and it does not need much imagination to realise that the entire available off-peak energy would not go far towards meeting the demand of the country for space heating. Over-optimistic claims only weaken the case for electricity and tend to cause unnecessarily bitter competition from other fuels.

Mr. Stanley gives a very simple and clear explanation of electrical terms and the theory of electric heating. This is followed by descriptions of fires, various forms of direct heaters, water heating, thermal-storage heating, estimates of heat required, running costs, and, finally, thermostatic controls. Much useful information on the correct placing of various types of direct electric heaters and their suitability for various purposes is given. There is, however, no very clear distinction made between low-temperature and high-temperature panels, and one is left to assume that they generally are equally suitable under all conditions, an assumption that does not do justice to the value of high-temperature panels for dealing with rooms where high standards of natural ventilation exist, as in modern schools.



This display at the showroom of the Brompton and Kensington E.S. Co., Earl's Court Road, demonstrates the cheapness of electric lighting as compared with a number of common commodities

Manufacturers of electrical thermal-storage equipment will not, in general, agree that a tariff of 0.4d. per kWh is low enough to make it a good commercial proposition, nor with the implication that 0.3d. per kWh is a particularly favourable rate.

It is surprising to read that under the Electricity Commissioners' regulations for the safety of the public a double-wound transformer is necessary to isolate an electric boiler from the supply system. There must be nearly a hundred boilers in this country that are connected direct and, whatever may have been the case some years ago, the Regulations of 1934 make provision for such connection. All that is necessary is that the approval of the Electricity Commissioners must be obtained. Statements of this kind are most unfortunate, since the heating industry will regard this chapter on electric heating as authoritative.

Some of the space given to the estimation of heat requirements might well have been devoted to a fuller description of piping arrangements for thermal storage plants. The former is largely repetition of matter that is dealt with elsewhere in the book, whilst the latter is peculiar to thermal storage, and is a subject that must be fully understood by the heating engineers if satisfactory results are to be obtained.

The estimates of running costs for thermal storage state that where energy is available for twelve hours per day the maximum theoretical consumption per year is 2,570 kWh per kW installed. This is correct, but to say that in practice the actual consumption will be something between 1,500 and 2,500 kWh per kW installed is not. By his own showing, the actual consumption for continuous heating will be 66 per cent. of the maximum; that is a higher limit of 1,700 kWh, and however inaccurate the control and however much overheating occurs, it will scarcely bring this up to 2,500 kWh. In actual fact, as most buildings employing thermal storage are not heated continuously the average figure is round about 1,000 kWh per kW of boiler capacity.

Hot-water Supply

In dealing with hot water supply, the author states that about four kWh is required to give a good bath and that this figure is arrived at on the assumption that six gal. of water at 160 deg. F. is required. Even if the cold water is, as he states, at the unusually low temperature of 42 deg. F. the efficiency is about 50 per cent. if four kWh raises only 6 gal. to 160 deg. F., whilst later on the efficiency of an unlagged tank with immersion heater is given as about 85 per cent. I do not think that even the most economically minded person would call a bath of 12 gal., *i.e.*, six hot and six cold, a good hot bath. Usually a bath requires from 20 to 24 gal.

No mention is made of the immersion circulator for hard-water districts. Of the two diagrams given of combined electric and coke boiler hot water supply installations, one shows a separate electric storage heater in series with a single draw-off pipe from an existing boiler and storage-tank system. This arrangement is out of date and is incorrectly described as being an alternative arrangement for electricity or a coke boiler, as the latter cannot be used alone. It is also incorrect to claim that when the boiler is in service the consumption of electricity is practically nil, as all radiation losses from the electric heater must be made good with the electric heater.

The object of the book in the words of the editor is " to produce for the first time an up-to-date, complete practical treatise on heating and ventilating in all its branches, including subjects previously unobtainable in text books on the subject." Ten leading experts have contributed chapters and it is claimed that there was a definite scheme to prevent overlapping. Nevertheless, considerable overlapping occurs, while omissions and contradictions are by no means infrequent. The basic principles of combustion are repeated three times, not counting the remarks on gas combustion; no notes on the theory of heat transmission through materials are given, whilst what is called furnace efficiency in one chapter is called boiler efficiency in another and the correct internal temperature for offices is given as both 60 and 65 deg. F.

The chapter on " Drawing " might well have been omitted to save space. A chapter has been devoted to each of such old-fashioned methods as warm-air furnace heating and high-pressure hot-water heating, which is quite unnecessary, while the latest development, high-temperature water heating, has been ignored. Much modern apparatus is omitted, such as " Economic "-type boilers, variostat control for heating systems and controlled forced draught firing systems; on the other hand there is an illustration of a Trentham Cornish boiler that is almost hoary with age. Pipe welding is given a page and a half, whilst three and a half pages are devoted to socket and spigot cast-iron piping, which should be as dead as the dodo to the modern heating engineer.

In one or two places terms are used without being defined and whilst the intention of the following sentence may be divined its meaning is far from clear: " When the fuel bed is thin and the air supply excessive too much air will pass through the fire, causing some of the carbon to pass off unburnt, so carrying away heat unnecessarily—by heating the excess air." The expressions " hydromotive force-producing circulation " and " pressure-producing hot water circulation " used in connection with gravity hot water heating are new to me and so far as I can see they mean nothing. If anything, the force produces the circulation, and not vice versa.

My general impression of the book is that it lacks continuity and cohesion, although as a series of separate articles on heating and ventilation it may be worth studying.

An Unusual Installation

Lavish use of light and heat

MANY of us have no doubt speculated upon how we would electrify our homes if expense were no object. In entirely rewiring and equipping Mr. W. Ford Hall's "Raumo," in Broadwalk, Snaresbrook, Mr. L. J. Beard, the Leyton electrical engineer and contractor, has been in the happy position of having more or less *carte blanche*. The resulting installation is one of the most elaborate and complete we have seen for a five-bedroom house. Already the total loading of the equipment installed amounts to 71 kW (lighting 13 kW, heating 31 kW, cooking 10 kW, water heating 10 kW, external lighting, etc. 7 kW), and when the floodlighting of the tennis court and the coloured lighting of the garden have been completed the figure will exceed 100 kW.

Generally speaking the system of illumination is well thought out and harmonises with the general decorative scheme which embodies a good deal of handsome woodwork. Architectural lamps in conjunction with obscured glasses have been used extensively. Laylights with bronze-finished framework carrying obscured and etched white and peach plate-glass panels provide a soft light for the lounge hall and the upper hall, the dining-room also having a laylight hanging flush with the ceiling in a recessed plaster cast, with four brackets fitted on the picture rail to relieve corner shadows. Orange and flame lamps illuminate niches in the lounge hall each side of the dining-room door and above a clock niche.

Concealed bedhead lighting is one of the attractive features of the house

In the lounge the general lighting comes from a cornice trough carrying forty-eight 284-mm. and sixteen 221-mm. strip lamps (loading 1,920 W), and to break up the shadows caused by the low ceiling a central fitting with a matt silver frame and pink-flashed opal glass has been introduced. A recessed and fluted plaster panel fitted with semi-cylindrical metal reflectors shielding ten 284-mm. strip lamps has been installed in an alcove, while red, green and yellow lamps under an obscured armour-plate glass shelf permit six colour changes in a niche containing a statuette.

For the bedrooms central fittings are employed supplemented where required by local lighting from bedside lamps, and architectural and inset fittings of various designs. The principal bedroom has, as an additional feature, a trough behind the bedhead throwing light on to a curved plaster cast which in turn reflects a soft light over the beds. Switches enable the whole or half the light to be controlled from either side of the bed or from the door. A special standard on the dressing table is to be replaced by a mirror lighting system.

Opal cube units have been installed in the kitchen, scullery and second bathroom, but round the walls of the first bathroom is a flush box fitting 10 in. below the ceiling, with flush panels over the bath and shower recess. Cupboards everywhere are illuminated automatically by ceiling bulkhead fittings as the doors are opened. There is a flush ceiling panel above the entrance in the porch and a Siemens "Neonic" lamp sign of the name of the house. Luminous indicators show the position of all switches and two- and three-way control has been installed wherever desirable. An extensive internal bell system has been employed and terminates in a 14-way pendulum indicator in the kitchen. The indicator is flush with the tiling and is provided with a zinc front screen in cream and blue to match the surrounding decoration.

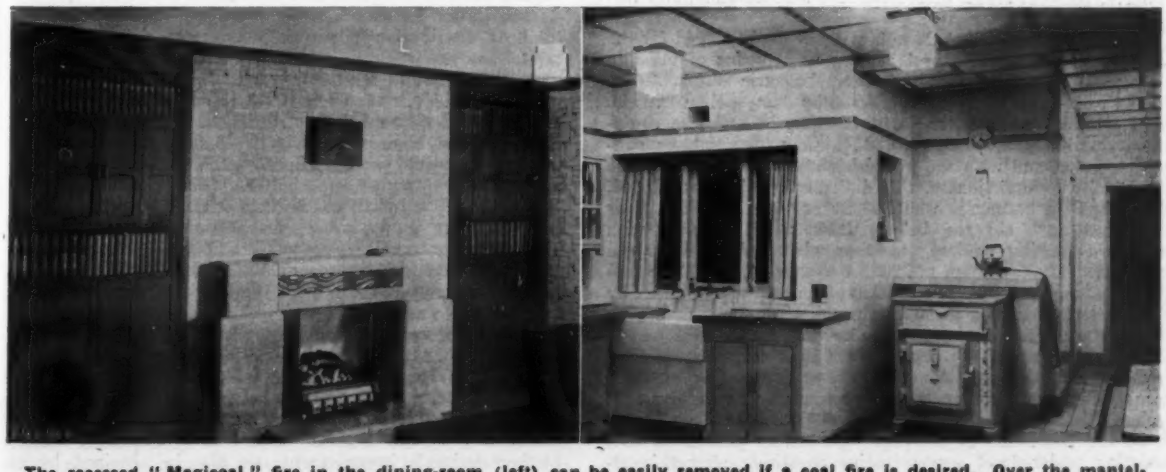
Electric heating, together with a generous array of power points, has been provided in every room, but in the reception rooms and hall the "Magicoal" imitation coal fires, though fitting right into their recesses, can be easily removed should a coal fire be wanted. A point of particular interest about these fires is the ingenious method adopted to keep the wiring out of sight. Inset fittings (Berry's Electric, Ltd., and W. N. Froy & Sons, Ltd.) have been installed in all the bedrooms but the largest, which has a "Mistoberry" fire with orange and blue lamps producing the impression of warmth or cold as desired. After various experiments in the loggia it has been decided to insert two 1-kW panel heaters one each side of the French windows.

The domestic staff, besides a sitting-room of their own, have a kitchen, scullery and larder equipped with every modern convenience. A 10-kW G.E.C. cooker has its "M.K." control unit recessed flush into the tiling and fitted with an oversize plate sprayed to match the cooker. In the larder the present refrigerator is shortly to be replaced by a new Grunow model. Whisking, beating, mixing, etc., are done by a Gilbert machine. A G.E.C. washer and an ironer are used in the scullery.

Though the domestic water supply is heated by a coke boiler in the winter, the 60-gal. lagged copper cylinder is fitted with five 2-kW Hotpoint immersion heaters for use in the summer or as an auxiliary for speeding up heating. The load is split over two phases with thermostatic control on two or three heaters, each 2 kW being relayed into circuit by time lags set at 5-second intervals.

Loud speakers let into the ceilings and walls all over the house are connected to a receiver in the lounge hall and are all fitted with remote volume and remote set control. The dials of the electric clocks have been specially designed.

For the electrical work so far about 4,000 ft. of conduit, 3 miles of cable and 287 lamps have been used. The necessary structural work in connection with the electrical installation has been carried out under the direction of Mr. C. E. Owen Ward. The lighting equipment was supplied by the General Electric Co., Ltd., the Sun Electrical Co., Ltd., and Ascog, Ltd. We are indebted to Mr. Beard for supplying the photographs used in this article.



The recessed "Magicoal" fire in the dining-room (left) can be easily removed if a coal fire is desired. Over the mantelpiece is a Smith electric clock. Local lighting is used to a large extent in the kitchen (right)

Meetings and Discussions

Costing Bulk Supplies

THE measurement of large supplies of electrical energy for costing purposes is discussed by Messrs. W. CASSON and A. H. GRAY (by permission of the C.E.B.) in a paper that was read before the Meter Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 6th. The importance of economically sound tariffs and accurate means of administering them is increasing yearly, they state, owing to the larger quantities being sold and the fact that the profit factor decreases as the load grows. In practice it is usual to approximate the accuracy of a tariff by the use of empirical factors with a simple equation. A tariff may be economically sound when initiated, but it is possible for considerable errors to arise if the natures of the loads (both of the consumer and the supply authority) vary to any large extent. Therefore, the authors suggest that the verification of the empirical factors employed from time to time is equally as important as the usual routine tests made upon the metering accuracy. One of the objects of the paper is to describe a method whereby the suggested checks may be made.

It is realised that frequent changes in tariffs would meet with opposition, but the authors feel that an accurate knowledge of the cost of bulk supply is essential when allocating tariffs for future consumers, so that comparison may be made with the actual charges in order to verify the accuracy of the tariffs.

The scheme outlined in the paper, while not devoid of errors, is claimed to be practical and to take into consideration such difficult factors as diversity and power factor, &c., without introducing serious complications. The type of metering equipment necessary for ascertaining the true cost is specified, together with certain aspects that must be considered when measuring maximum demand and power factor. Finally, a new type of "Metrovick" kVAh meter is described and its performance in practice outlined. This new instrument has been developed in the following manner.

Bulk Supply Measurement Utilising Surplus Heat Effects of Fluctuating Voltage

The authors have so arranged an induction watt-hour meter that the voltage and current occupy the same relative phase relationship independent of the power factor of the system. The method is not new, but the apparatus has several novel features. The new meter is in two separate parts, namely, (*a*) a standard kWh meter fitted with a demand indicator, and, if necessary, means of transmitting impulses to a recorder; and (*b*) a power-factor compensator which provides voltages whose phase displacements follow those of the current vectors.

The compensator consists of a p.f. relay in the form of a simple motor element accurately calibrated for p.f., whose rotor is a contact maker. This relay actuates a phase-shifting device, which consists of three delta-connected resistances, or chokes, with taps connected to a circular switch containing thirty-six contact studs. These are traversed by two pairs of motor-driven brushes rigidly fixed 60 deg. apart. The taps provide voltages of equal magnitude, but displaced by 10 deg. vectorially one from the other, through the whole 360 deg.

When a phase displacement takes place between the voltage and current energising this floating relay its rotor contactor starts the driving motor. This commences to rotate the two pairs of brushes round the voltage selector, which thus impresses voltages of differing phase displacement on both the p.f. relay and the meter. When a voltage is thus selected in phase with the current the p.f. relay loses its torque, so stopping the selector motor. This procedure will occur each time the p.f. of the system varies, each time impressing a new voltage upon the meter, and so keeping it always in the same phase relationship to the current.

An outstanding advantage of this contrivance is said to be its simplicity compared with most existing methods. Its inherent accuracy is maintained throughout the whole 360 deg. without the necessity of an extraneous relay. The provision of the compensator as a separate item reduces the calibration difficulties, since the meter portion only needs to be calibrated, the compensator being simply routine tested.

* * *

Thermal-electric Heating Plant

INDUSTRIAL, agricultural and domestic heating, with electricity as a by-product, is the subject of a paper by Mr. S. B. DONKIN, which was read at the INSTITUTION OF CIVIL ENGINEERS in London on December 10th. The author states that by providing means for using the latent heat in steam for industrial, domestic and horticultural heating the thermal efficiency of a combined station which generates electricity and utilises the surplus heat can be raised to 60 or even 70 per cent. where suitable arrangements can be made for the balance between the electricity-demand and the heat-demand.

Some of the characteristics of the more important existing installations are included in an appendix to the paper, together with a bibliography of published articles descriptive of station plant and operating statistics. Heat-flow diagrams show that high overall thermal efficiencies are not exceptional for such stations, while the paper briefly treats of such equipment as boilers, pass-out steam pressures, heat accumulators, and turbines.

The author states that there is without doubt a field for the introduction of horticultural heating as a means of utilising low-grade heat from combined thermal-electric stations. The growth of plants is adversely affected by dust, carbon dioxide, and sulphurous fumes, but with modern boiler-house equipment, with chimney-heights and chimney-temperatures suitably chosen, and with the scrubbing plants advocated by the Electricity Commissioners, this difficulty can be surmounted. Such heat in hothouses would allow growers to reduce their "top-heating" charges below those now common with standard heating equipments, thus giving them a margin which would allow them to install hot-water soil- or "bottom-heating" equipment. The heating of soil in tomato houses by hot water circulated through pipes buried about 18 inches below the surface has been shown to yield earlier crops and to increase the weight of fruit grown. It is suggested that installations of this kind should, wherever possible, be carefully considered in any comprehensive thermal-electric development scheme.

In the latter half of the paper the author points out that existing under-street service mains constitute almost insurmountable barriers to the installation of heat-distribution networks in some of the older manufacturing towns. However, when laying out new industrial areas the thermal-electric scheme presents possibilities which must not be neglected.

Support is being given to the suggestion that satellite towns should be created in certain areas as a means of absorbing unemployed labour into newly established industries, and the author maintains that this affords an opportunity for designing a town with a view to the most efficient use being made of the heat value in the fuel by making it available to industry and other services.

A plan of such a town, for a population of 100,000, has been prepared by Messrs. Thomas A. Mawson & Son, architects and town-planning consultants. The industrial zone would be designed to ensure maximum economy for hot water and electricity distributing mains. Inside the industrial zone and close to the power station would be greenhouses so that heat might be provided from the condensing water. Surrounding the whole area would be an agricultural belt for farming, market gardening, and chicken farms, some of which might require heat. The author estimates that a 30,000 kW thermal-electric station for such a town would cost £550,000, and that the heat distribution pipework would cost £50,000. Total capital charges would be £48,450 per annum and the working costs £67,900. The revenue expected is £122,200, showing a balance of £5,850. The effect of selling surplus electricity from the combined thermal-electric station to an outside authority in winter and buying electricity from the latter's surplus in the summer would probably improve the credit balance shown in the example quoted, especially as with the same plant the electrical load factor should be improved. The prices of heat and electricity are as low as possible to provide only for an annual reserve fund. If any public utility company developed such a scheme the prices for the two commodities would probably be increased to provide the desirable additional profit. Mr. H. R. Ayton, in his presidential address to the Belfast Association of Engineers on November 13th, 1935, worked out a somewhat similar example.

The greatest practical difficulty in operating a system of this kind would be to secure a proper balance between the electrical and the thermal loads. Heat accumulators furnish a physically satisfactory method of accomplishing such a balance, while a further desirable improvement can also be obtained by an interchange of electrical energy with the existing statutory supply authorities. Such authorities would find that small thermal-electric stations could assist them materially with their load conditions, because in the winter months when large

quantities of heat are required the thermal-electric station would have surplus electricity to sell at relatively low rates; on the other hand, during the summer months the demand for heat would be limited to process-work, so that it would probably prove economically sound to shut down much of the plant and purchase the out-of-balance electric power from the area network of the surrounding supply authority Thermal-electric plants of the type envisaged in this paper must be regarded primarily as distributors of heat, and the electricity which they generate is one of the saleable by-products which they generate from the fuel with which they are supplied. The importance of utilising more than twice as much of the available heat in the coal burnt should prove a conclusive argument in favour of combined thermal-electric stations where these can be installed economically in themselves and without detriment to existing supply authorities.

* * *

Voltage Variation Problems

TWO papers dealing with voltage variation were submitted at the December 11th meeting in London of the Transmission Section of the INSTITUTION OF ELECTRICAL ENGINEERS. The first, by MR. F. S. NAYLOR, deals with the loss of revenue from domestic consumers in consequence of failure to maintain the service voltage within the limits (now ± 6 per cent.) prescribed by the Electricity Commissioners' Regulations. He shows how it can be estimated from graphical load records, stress being laid on the magnitude of the possible annual gain as compared with the capital charges on the cost of voltage correcting equipment, if the latter be installed.

The author's results indicate that the loss is sufficiently large to warrant closer consideration, and in certain cases to justify expenditure on network modification, or the installation of automatic voltage regulators at or near the l.v. supply points to outlying distributors. The object throughout is an endeavour to arrive at the gain in revenue obtainable by the prevention of voltage variation.

In order to demonstrate its relative importance the principle is applied to the calculations normally carried out when transformers are being purchased, and in the case considered it is shown that it completely outweighs in importance the cost of iron and copper losses. The author's analysis at least emphasises the necessity of elucidating the principle of revenue loss so that its acceptance or rejection can be properly decided and its correct position allocated as a factor in the design of distribution schemes.

Practically all household appliances are affected by voltage drop. The reduction (or increase) in consumption for such voltage variations as are normally encountered is 0.79 on lighting, 0.975 on heating, and, say, 0.9 on mixed lighting and heating of that obtained on resistance load unaffected by temperature.

The manner in which the revenue is affected by reason of the reduced consumption is largely governed by the tariff. A high rate per kWh will mean a greater loss than a fixed charge, independent of maximum demand, and a low kWh running charge.

Furthermore, excessive voltage drop might induce a consumer to replace a lamp by one of higher wattage, or to switch on two fire bars instead of one, or to discard a cooker altogether, whereas a slight reduction of voltage would not concern him to the same extent. For instance, he might use his cooker for a longer period (with increased consumption) for the same operation. He might, however, set a limit to the amount he was prepared to pay per quarter for his electricity, and any sudden adjustment of voltage to its correct value might cause him to economise in the use of his domestic appliances. Thus it would appear that large voltage variations affect all apparatus from a revenue-earning point of view; but with small voltage drops, only lighting, fire and wireless-set loads can with certainty be said to be affected in a manner which lends itself to calculation.

The second paper, by MESSRS. E. B. WEDMORE and W. S. FLIGHT, is a report (Z/T41) of the British Electrical and Allied Industries Research Association, representing a statistical study (to which further consideration is still being given) of voltage variation at consumers' terminals. Hitherto no attempt seems to have been made to investigate the "distribution" of voltage variation, *i.e.*, the relative frequency of different amounts of departure from normal. Such a distribution curve is a picture of the quality of the supply, and the report contains novel suggestions for the preparation and study of records of this character.

The effect of voltage variation upon the performance of different classes of apparatus is dealt with in detail, and the problem of control of voltage variation is surveyed generally from a theoretical standpoint, but leading to conclusions of practical interest. For instance, the consumer is concerned with supply at his consuming points, not at his "terminals," and this is affected by the voltage drop in his wiring. The revenue of a supply authority is increased by better regulation and especially by avoiding excessive drop of voltage.

The tolerances on regulation, consumers' drop, and on sales and manufacturing ratings alone may altogether result in apparatus being used at voltages departing roughly 16 per cent. from the best values. The average departure on particular systems is likely to reach 2.5 per cent.

With incandescent lamps, voltage variation *per se* is not detrimental to life or average lumens, but departures from the declared voltage of the average at the lamp terminals seriously affects both life and light. Mercury-vapour discharge lamps are sensitive to voltage drop on starting-up and also to sudden fluctuations within limits which require consideration.

With heating and cooking apparatus departures of the average from the normal voltage, or any sustained departure from normal, may seriously affect satisfactory performance and, in some cases, "life" also.

Most other appliances are relatively insensitive, but in exceptional cases special regulation is essential. Thus, plus and minus tolerances on declared voltages at consumers' premises are mainly important to secure against temporary inconvenience. From the standpoint of performance the important feature is the (weighted for load, showing the relative amounts of power delivered at each voltage) average voltage at consuming points in relation to the declared voltage.

The many factors which enter into voltage variation may in cumulative effect be considerable and serious in individual cases. Relatively larger departures from the declared voltage may reasonably be allowed where (i) voltage variation from a transmission system is superimposed on that due to the distribution system, (ii) the system is extensive and has a mixed load, and (iii) also in the early stages of development of a new and growing undertaking.

There appears to be no justification for allowing equal plus and minus tolerances on declared voltage, as the drop on consumers' premises acts always in one direction. In legislating for tolerances the method of measurement of departure from normal requires consideration, especially in relation to the time factor.

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Electric Railway Signalling

THE paper in which Major L. H. PETER, of the Westinghouse Brake & Signal Co., Ltd., describes recent railway signalling developments, to which reference was made last week, was discussed at the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 5th. Mr. R. DELL explained how the outlook of the railway signal engineer differed from that of other electrical engineers, because he was constantly searching for greater safety; he spent much time in anticipating possible failure and in fitting safeguards designed to prevent dangerous conditions arising. Mr. Dell was of the opinion that the only system of cabling that could be defended was that in which every cable was surrounded by an earthed screen (a lead sheath) because it was essential to avoid the possibility of circuits becoming falsely energised. He did not favour the 110-V system of distribution with both poles insulated, under which the utility of earth detectors depended upon action being taken by some member of the staff immediately after indication was given. He preferred the return bus-bar to be earthed, *i.e.*, to the cable sheaths, all of which should be carefully bonded together.

Reliability on the L.P.T.B. system, he said, was assisted by careful records being kept of all faults; these records were periodically analysed to enable alterations to be made whenever a recurring fault indicated the need for modification. Reference to Southern Railway practice was made by Mr. W. CHALLIS, who said that mains power supply was becoming increasingly available and had been taken full advantage of. In a few places only had it been necessary to employ hand generators for point operation. Mercury rectifier ripple voltages had been found on one section of the Brighton railway and had caused some perturbation. Several remedial measures had been tried without entire satisfaction, but by very careful adjustment the track circuits could be made immune. Mr. Challis said that power engineers should help signal engineers to eliminate ripples from railway signal systems. He also asked whether the traction voltage could not be increased in order to reduce the current that had to be returned through the track to the sub-stations. These heavy currents flowing along sections carrying considerable traffic caused the numerous track bonds to become saturated and affect signal circuit adjustments. This point was also raised by Capt. B. H. PETER, who said that the large traction currents that

were returned to the sub-stations constituted a real problem, and the use of higher traction voltages would simplify matters for signal engineers. The best way of solving the power supply problem would probably be for the railway companies to take in substantial supplies of electricity at certain points and to distribute it themselves.

Mr. H. H. DYER considered the paper opportune because they wished to enlist the sympathy of power engineers. Railway signal engineers made demands of from 0.5 to 25 kVA and, although they offered very good load factors, were in much the same position as farmers who were unable to obtain supplies from nearby grid lines. Mr. PRESCOTT contended that signalling must be considered on a large scale in order to avoid a state that would be analogous to the insertion of a short length of large diameter pipe in a long main of small diameter. Continuous engine cab indication, he said, was the best way of maintaining a proper space factor between trains. The question was not whether the railways could afford such things, but whether they could be done without.

When asked to say something about the treadle he had devised for train-counting mechanism, Mr. J. B. GRIFFITH said that it had recently been used successfully at a speed of 90 m.p.h. The photo-electric cell was not the best means of counting. The problem was not an electrical one, as automatic telephone apparatus had proved. The difficulty was to construct a treadle that was light enough and yet would not be subject to damage at high speeds.

Mr. ROGER T. SMITH doubted whether it was wise to aim at automatic driving of trains, as there were all sorts of things to be looked for on the track road beside signals.

That the Post Office had experienced similar problems to those of the railways with regard to the provision of power at outlying points was stated by Lieut.-Col. A. G. LEE. He said that the P.O. found it economical to distribute power over its own telephone lines for quite long distances.

Major L. H. PETER, in reply, said it was surprising how much signalling could be done by means of power distributed by two 110-V lines on simple poles; the railways would probably have to carry out their own distribution. If they could get electricity in signal cabins it would be used for such additional purposes as lighting, heating, battery charging, &c. The impression that all the signal engineer required was 0.25 kW as a maximum load should not be allowed to spread. Track relays were not now seriously affected by ripple voltages; he was quite satisfied that that was no longer a major problem. He had not included anything in the paper which had not been tried out or was not now working in service. The automatic driver could not be ruled out as an impossibility, for the P.O. tube railway in London was already operating without drivers.

* * *

High-voltage X-ray Tubes

AT the annual congress of the BRITISH INSTITUTE OF RADIOLOGY in London last week the eighteenth Silvanus Thompson Memorial Lecture was delivered by Dr. G. W. C. KAYE in the form of a reminiscent review of "Forty Years of Radiology." A contribution by Dr. L. H. GRAY dealt with the ionisation method of gamma-ray energy measurement. A paper was read by Dr. J. READ, of the Radium Institute, on "High Voltage X-ray Tubes in the U.S.A.," in which the history and present development of tubes operating at up to one million volts were discussed. Dr. Read said that from the electrical point of view the construction of suitable high-voltage generators, whether for constant or pulsating voltages, presented little difficulty, and generators supplying X-ray tubes of the demountable continuously evacuated type had been installed in several American hospitals.

Pioneer work was carried out by Lauritzen at the Kellogg Laboratory, Pasadena, and in 1927 an X-ray tube for 600 kV peak was erected. Later a tube for higher voltages was made, with an earthed central discharge chamber and insulated electrodes. This tube, which was of the hot-filament type, was evacuated by means of oil-vapour diffusion pumps, and proved capable of operation at up to 900 kV peak. The high voltage was supplied by four transformers in series, no rectification being necessary. A similar outfit at the Soiland Institute makes use of an X-ray tube in which the insulating arms consist of large transformer bushings. This construction is less bulky and more easy to make vacuum-tight than the earlier models. At Lincoln (Illinois) and at the Harper Hospital, Detroit, similar X-ray tubes are operated at 750 kV and 500 kV, respectively, by constant voltage generators, consisting of several generators of the Greinacher type in cascade.

At Seattle and Chicago tubes of a somewhat different type are used at 850 kV peak. The exciting electrons undergo successive accelerations by several tubular internal electrodes. The high-voltage generators are of the Villard type, cascaded, and the accelerating electrodes are connected to points on the generators at suitable potentials. The electron paths in these tubes are about ten feet long, and in practice some difficulty is experienced in securing a steady focal spot, as the electron beam is deflected by magnetic fields.

An equipment of an ingenious type devised by Dr. Sloan is in use at the San Francisco Hospital. The high-voltage transformer is of the Tesla type, operated by a valve-maintained power oscillator at a frequency of about 50,000 kc. per second. The primary of the transformer consists of a single turn and the secondary of twenty turns, properly tuned and coupled as closely as possible. The free end of the secondary carries the target and the whole transformer is contained in a highly evacuated tank, provided with a suitably shrouded filament, so that, in effect, transformer and tube are housed in a single envelope. This system apparently operates satisfactorily, if somewhat inefficiently, and has the advantage of being compact. The transformer windings are of concentric tubes to permit water cooling. It was difficult to secure adequate cooling and to prevent mechanical oscillations.

These equipments are to be regarded as of an experimental nature, although Dr. Read stated that, after some experience had been gained, the tubes operated for long periods without serious breakdown, and the carrying out of clinical work was not often interfered with.

In the subsequent discussion Prof. HOPWOOD said that this country had lagged behind America in the installation of high-voltage X-ray equipments, but an outfit to operate at a million (constant) volts was in course of erection at St. Bartholomew's Hospital, London.

* * *

Testing Electrical Equipment for Mines

AT the December 10th meeting of the London branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS a descriptive account was given by Mr. H. RAINFORD of the Mines Department testing station for flameproof enclosure of electrical apparatus, of which the author is testing officer. This station is on the premises of the Safety in Mines Research Board's experimental station at Harpur Hill, near Buxton, and the author described the test equipment and testing procedure.

The method of preparing explosive mixtures was indicated, and reference was made to the "B.C.D.," "Bureau of Mines," and electrical manometers. The last mentioned was developed by the Safety in Mines Research Board, and is capable of accurately following the more rapidly applied pressures, such as are obtained from gaseous explosions of mixtures containing hydrogen in air and acetylene in air.

Of the diaphragm type, the instrument has only one moving part, namely, a small disc of "Invar" steel clamped at its edges and stretched radially, the natural frequency of the disc being of the order of 10,000 cycles per second. Behind the diaphragm is an insulated metal plate, the initial distance of this plate from the diaphragm being pre-set to a suitable value by means of a micrometer head. The change in the electrical capacity between the diaphragm and the back plate when the diaphragm is displaced under the influence of the pressure developed is used to record the magnitude of that pressure.

The diaphragm (condenser) system forms a resonant circuit with an inductance and this circuit is loosely coupled to an oscillation generator which supplies the manometer circuit with a constant voltage at a fixed frequency. The voltage developed across the manometer circuit is applied through a diode and a low-pass filter to the grid of a valve voltmeter, the anode current of which is passed to a Duddell oscillograph. The anode current varies with the application of pressure to the diaphragm and has its greatest negative value when the diaphragm is undeflected. In this manner the recorded oscillogram is made a direct function of the pressure.

Between July, 1931, and September, 1935, the number of units submitted per year for examination and/or test increased from eighteen to 150, and the number of reports issued per annum from twenty-one to 232.

* * *

Electrical Insulation

"Modern Electrical Insulation" was the subject of a lecture by Prof. SAY in the Heriot-Watt College, Edinburgh, on December 6th. An indication of the possible trend of insulation technique, he said, was to be found in the development of synthetic materials. Demonstrations were given of the behaviour of liquid insulators in strong alternating electric fields; of the breakdown of gaseous and solid materials; and of testing by means of the Schering bridge network.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

The Value of Qualifications

With reference to the letter from "Aspirant" in your issue of November 8th, a university degree is only an indication that a man has studied and has benefited by his studies. Our friends in Bengal quite logically designate themselves as "Failed B.A.," &c., implying that they have read through the prescribed course of study even if they have not succeeded in passing the examinations. I have never forgotten the farewell which the Dean of the Engineering Department gave me when I left the university. After wishing me success he said: "We do not pretend to have taught you very much, but we hope that we have taught you how to think."

The possession of a university degree is no criterion of a man's ability as an engineer. On the other hand, university training gives a man who has the right instincts a background which nothing else can. His contact with men of exceptional ability and scientific attainments and his access to experimental equipment are of inestimable value. This is, no doubt, the reason why the University of London has decided to insist upon "course work" at some college or institution even for external students.

Membership of a recognised engineering society is an indication of a certain number of years of successful engineering work, and a man who can show such membership, as well as a university degree, is generally a real engineer. On the other hand, we all know men who have obtained a university degree in engineering, but who would have the greatest difficulty in qualifying for membership of one of the leading societies.

The point I am getting at is that to most of us who are responsible for engaging men, the possession of one university degree, in addition to proved engineering ability, is considered an essential for men in senior positions. The possession of degrees in more than one subject makes one wonder whether the applicant is not too much of a theorist and perhaps lacking in practical experience of men and plant. If I were in "Aspirant's" place I would mistrust employers who thought too much of a long line of degrees and qualifications.

Quebec, *November 27th.* B.SC. LONDON (1908).

Motor-car Voltages

Your correspondents "H. C. C." and "C. W. G." raise objections to the 6-V system because the 12-V is less affected by high-resistance lampholder contacts and volts drop, but why should six cells be provided instead of three merely to allow for poor lampholder contacts and undersized cables? Why use the same size conductors on 6 V as would be satisfactory for 12 V? If a higher voltage is desirable, why not 18- or even 24-V?

My critics possibly see the disadvantages above 12-V, but I see them on any pressure above 6-V as being out of all proportion to the single advantage. In my opinion when prejudice and fancy give way to actual fact, the 6-V system will be much more in favour, if not indeed universal.

My statement that 6-V filaments are infinitely stronger than 12-V has so far not been challenged. I have owned cars equipped with both 12-V and 6-V systems and, as a result of experience since 1910, I decidedly prefer the latter with which I have had less trouble.

The most popular 12-V batteries have nine or eleven plates per cell and the most popular 6-V thirteen or fifteen. Comparing the 12-V eleven-plate with the 6-V fifteen-plate cells, every advantage is with 6-V.

12 V.	6 V.	Advantage.
Ah. capacity, 72. Weight, 76.5 lb. Price, £5 5s. retail. No. of cells, 6.	Ah. capacity, 103. Weight, 49.5 lb. Price, £2 10s. retail. No. of cells, 3.	31 Ah. greater. 27 lb. less. Less than half. Chance of failure, 50% less.

I do not agree with "C. W. G." that the 6-V battery needs to have double the capacity of the 12-V, because lamps and other load are not consuming current all the time. Starting-motor consumption is only momentary, and I would emphasise that the battery only supplies the current demanded, which on rare occasions exceeds the output of the generator or dynamo. As a result of more than twenty years' experience in the automobile electrical industry, I can positively assert that far more batteries, whatever the voltage, need replating as a result of overcharging than of "starvation."

My original intention in opening this discussion was to break down the prejudice against the 6-V system, or to find out any shortcoming of the 6-V which I myself might have overlooked. Whilst I quite readily admit that the 6-V system does present a problem with regard to the design of the starting motor I believe that in an attempt to avoid the difficulty of providing sufficient copper and iron in the construction of starting motors of less than 5in. diameter, designers have hastily sought relief in the 12-V system without a full realisation of its disadvantages.

A new battery costs little more than a new tyre, and yet some car owners are extremely reluctant to replace this much-abused and overworked unit. With a tyre wear and tear is apparent, but with a battery, the elements of which are all enclosed, some motorists expect that it will continue to give good service almost indefinitely.

My advice is to stick to 6-V and have a new battery at 50s. every twelve months if necessary. Suppose the average price of a car is £275 the price of a replacement battery is below 1 per cent. and the repair would cost even less.

London, S.E.11. E. G. FORD,
December 3rd. *Managing Director,*
Autocar Electrical Equipment Co., Ltd.

Two Christmas windows: Left: At the showrooms of the Metropolitan-Vickers Electrical Co., Ltd. Right: One of the Magnet House windows (G.E.C.)

Cheap Electricity?

"Grid" states that the Central Board's efforts would be negatived by an increase in the cost of fuel. This does not necessarily follow. The benefits conferred by the transmission lines are quite independent of the fluctuations in the price of coal.

If the Central Board had not come into existence any increase in cost of coal would still have to be borne by the supply undertakings and passed on to the consumers. Under these conditions the consumption of fuel would have been greater, and it is possible that the increased demand would have advanced the price of coal. W. E. P.

December 9th.

Electrical Fires in Mines. By "F. S."

How they can be successfully combated

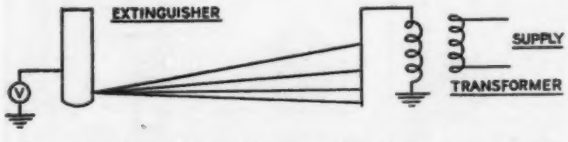
THE successful and safe extinction of electrical fires in mines, especially coal mines, is not easy. The fire-fighting appliances installed must be safe in unskilled hands, no noxious gases must be given off, or generated; and, furthermore, it is often required that the appliances shall be quickly rechargeable.

For use in haulage and pump rooms, the pump type of extinguisher containing carbon tetrachloride, which is a non-conductor, has long been a favourite, but has recently fallen into disuse owing to the possibility of harmful gases being generated when the carbon tetrachloride liquid comes into contact with burning material, the biggest risk being the chance of forming phosgene gas.

Tests of the atmosphere which were carried out after a fire had been extinguished by means of carbon tetrachloride in a confined space confirmed the presence, among other constituents of phosgene gas in the ratio of 20 to 90 parts per million and hydrochloric acid gas in 150 to 225 parts per million. Although the above proportions are not high, nevertheless they show that the carbon tetrachloride type of extinguisher is not desirable for use below ground.

The Foam Jet Method

Any type of extinguisher giving a jet chiefly composed of water can be ruled out. Among the liquid easily rechargeable extinguishers the "foam" pattern remains. Broadly this type consists of an inner and an outer chamber, the inner vessel containing a weak acid salt solution and the outer an alkaline solution incorporating a "stabiliser," or bubble toughener. On inverting the extinguisher the two solutions mix, CO_2 gas is generated, and the resulting pressure forces the liquid out in the form of foam, the bubbles being distended with CO_2 gas. The foam will not injure metalwork or insulation and, in a stream, is non-conductive. One leading firm of fire appliance manufacturers has had tests carried out with such a foam stream at a high voltage. The test was arranged as shown in the following sketch.



The suspended metal plate was charged-up to a potential of 33,000 V r.m.s., and the foam jet from the extinguisher, which was mounted on an insulated support, allowed to play on it from a distance of 20 ft. The sensitive voltmeter connected between the extinguisher and earth recorded no potential whatsoever. Later an assistant held and played the jet on the plate at a potential of 33,000 V r.m.s., as above, at a distance of five feet and experienced no ill effects. Although the above tests have shown that an operator standing at a reasonable distance from a source of electrical potential and directing a jet on to it is safe, there is always the chance, especially below ground where space is limited, of the operator approaching too near and even allowing his extinguisher to come into contact with "live" metal. This risk has now been overcome by supplying extinguishers completely coated with a layer of vulcanised rubber about an eighth of an inch thick. Provided that the outside of such an extinguisher is kept clean and free from moisture, the chance of anyone using it on an electrical fire obtaining a shock should be very remote indeed.

The foam acts by forming a blanket over the burning material and, oxygen (air) being thus excluded, the fire is smothered. This property of forming a blanket renders the foam type of extinguisher eminently suitable for dealing with transformer and oil-immersed switchgear fires, although as foam in the mass is somewhat conductive, care must be taken not to approach too near to the affected apparatus until it has been ascertained that the current has been cut off. No noxious gases are emitted when foam is used. In fact tests below ground have shown that an immediate improvement in atmospheric conditions has taken place as soon as the foam extinguishers have been brought into use, the oxygen content going up and the carbon dioxide content quickly decreasing.

Automatic protection of underground transformer rooms can conveniently be arranged by means of the foam system, a simple method consisting of a large suspended foam extinguisher, kept in an upright position by means of a system of rods and levers incorporating one or more fusible links. On a fire breaking out the fusible link melts and the extinguisher turns over, allowing the two solutions to mix and be discharged in the form of foam. Even such a simple system as the foregoing has its pitfalls; one colliery company having installed such a system, found to its cost that no protection existed for the carcase of the tranformer when removed for repairs some distance away from the oil-containing tank. The protective system has since been duplicated, one foam extinguisher being mounted on rails and arranged to slide over the carcase when removed from its oil tank.

Dry Powder Type Extinguishers

Quite recently a dry powder type of extinguisher has been passed for use below ground. It resembles a large pistol, the barrel being charged up with marble, chalk, and other fine dust, the whole being discharged in the form of a cloud by the explosion of a cap. The "pistol" is recharged by changing the barrel, each barrel being sent out complete with cap and powder. Another dry powder type consists of a steel cylinder charged with powder, but released in this case by means of compressed CO_2 gas. The sponsors of the dry powder type of extinguishers are hoping that they will take the place of the disused carbon tetrachloride type for use in motor and pump houses below ground. So long as care is taken not to touch "live" metal, they are certainly safe for use on electrical fires, although it is possible that the dust used might do as much damage to bearings, etc., as the old sand bucket.

The CO_2 type of extinguisher, which consists of liquid CO_2 under pressure, has been but little used below ground. While it is clean and safe in use so long as the gas stream is directed with a fibre nozzle, the question of ventilation carrying the gas away and thus defeating the object, which is to smother the fire under a blanket of dense gas, must be considered; furthermore, the cylinders must be returned to the makers for recharging. It is interesting to note that CO_2 gas is not toxic in its effect. It merely will not support life.

Methyl bromide is an extinguisher of the same type as the CO_2 pattern mentioned, and the same remarks apply to it. It is also somewhat more expensive to recharge.

Cine-radiography

APPARATUS capable of recording the movement of living organs, joints and tracts as seen on the fluorescent X-ray screen has been made, according to Dr. Russell J. Reynold's system, by Messrs. Watson & Sons (Electro-Medical), Ltd., and is now commercially available. It is so arranged that in addition to cine-radiography, normal radiography, screening, and "tele"-radiography can be undertaken. Cine-radiographic films permit leisurely and repeated study of functional movement and afford a valuable method of obtaining permanent records for investigational comparisons or diagnostic and teaching purposes.

The reduction of the patient's exposure to radiation is accomplished by synchronising the camera drive with an oil-immersed rotary disc type circuit-breaker in the primary of the input transformer, which permits the X-ray tube to be energised only when each individual "frame" is in position and at rest behind the camera lens. This halves the time during which the patient is subjected to radiation and reduces the amount of film required.

The film is non-inflammable and coated with an emulsion that is particularly sensitive to rays of the wavelength emitted by the special fluorescent screen from which the X-ray image is photographed direct. The camera is not affected by phosphorescent "afterglow." It also has a very wide aperture lens of f0.85, and together with its 1,500 r.p.m. synchronous driving motor, speed reducing gear, rotary synchronising switch, speed counter and other refinements, is mounted on a table that is rotatable and adjustable for height. The table is mounted on an extension of the steel track on which runs the adjustable "Sunic Paravent" protective device associated with the "Telestat" screening stand, which has a rotatable patient platform and simple means of adjusting the tube and screen focus distance. The camera speed can be varied without upsetting the synchronism between the camera gate and primary circuit-breaker.

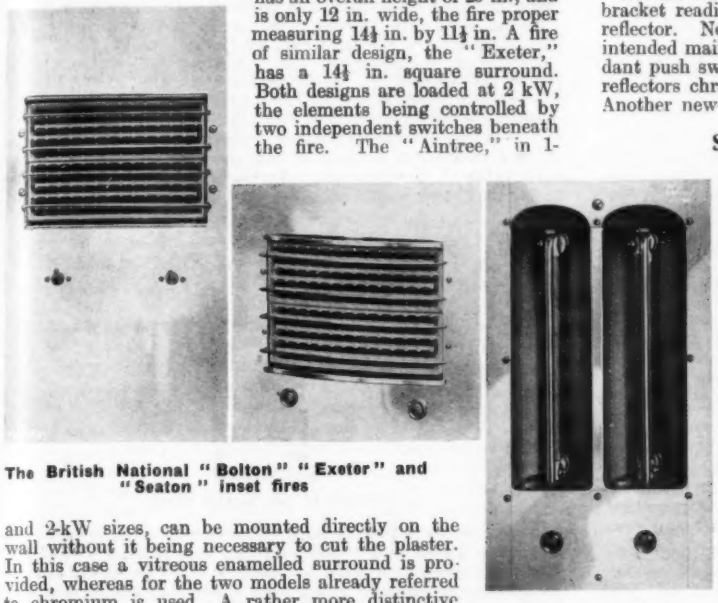
The 10-kW "Metalix" X-ray tube is fed from a mains input step-up transformer through a "Metalix" gasfilled valve "generator" (rectifier) the emission of which is largely independent of filament temperature. Thus output is not affected by a falling off in line voltage.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Inset Fires

The range of inset electric fires made by BRITISH NATIONAL ELECTRICS, LTD., Newarthill, Motherwell, has been extended to include several new models. One of these, the "Bolton," has an overall height of 25 in., and is only 12 in. wide, the fire proper measuring 14½ in. by 11½ in. A fire of similar design, the "Exeter," has a 14½ in. square surround. Both designs are loaded at 2 kW, the elements being controlled by two independent switches beneath the fire. The "Aintree," in 1- and 2-kW sizes, can be mounted directly on the wall without it being necessary to cut the plaster. In this case a vitreous enamelled surround is provided, whereas for the two models already referred to chromium is used. A rather more distinctive type is the double-reflectored "Seaton" model, in the 2-kW size. It has a sheet metal chromium-plated surround, and is suitable for permanent installation on either side of a coal fireplace. All British National fires are fitted with d.p. switches.



The British National "Bolton" "Exeter" and "Seaton" inset fires

An Electric Steriliser

Tests on an electrically heated sterilising plant for dairy utensils have been carried out by the National Institute for Research in Dairying (Reading University) under the authority of the Minister of Agriculture and Fisheries (Report No. 58, Stationery Office, 2d.). The plant, known as the Clifton electric steriliser, consists of a vented steam chest measuring 4 ft. by 3 ft. by 3 ft. and constructed of 12-gauge galvanised plate with a 2-ft. wide hinged steam-tight door seated on rubber gaskets; insulation is by 1½ in. of slag wool. The tubular boiler is detachable from the end of the chest and is heated by two elements inserted at the base with connections for varying loadings. A ball-valve tank, connected to the boiler by a non-return valve, provides the feed water. The elements can be switched in and out twice daily by a clockwork control. Steam is generated at atmospheric pressure and fed by an internal pipe into the chest, all condensation returning to the boiler.

In test A the electrical loading was two-thirds. A (1) The chest was filled with tinned steel utensils and steam was raised in eight minutes; the temperature of the chest was brought up to 210 deg. (evenly distributed) in fifty minutes. In test A (2) the chest was full of glass bottles; steam was raised in nine minutes, and the chest was heated to 210 deg. in seventy-two minutes.

Test B was at full loading. In B (1) the contents were as in A (1), steam being raised in six minutes and 210 deg. in the chest reached in forty-one minutes. In B (2) glass bottles again formed the filling, when steam was obtained in six minutes and 210 deg. in fifty-eight minutes.

Every case represented the average of three trials and the sterilising temperature (210 deg.) was maintained for ten minutes each time. The kWh used in test A (1) was 5.8, A (2) 7.8, B (1) 6.3, B (2) 9.2. The makers, Messrs. J. W. WOOLEY & Co., Clifton, Tamworth, also produce a steriliser measuring 3 ft. 4 in. by 3 ft. by 2 ft. 8 in., which consumes about 4 kWh for the complete operation.

Architectural Lighting

Specially designed reflectors for the accommodation of "Maxtrip 2" lamps have been produced by STRAIGHT-LITE REFLECTORS, LTD., 73, Canonbury Road, London, N.1.

There is a one-light wall unit consisting of a semi-circular white flashed opal glass enclosing the lamp. The outer frame can be obtained in polished chromium plate or colour sprayed, while the bottom is filled with white flashed opal glass. There is another model designed for direct mounting of a colour sprayed "Maxtrip 2" lamp. This is available as a one-, two- or three-light unit.

No. 210 is a single-light desk or wall unit suitable for a wall-bracket reading lamp. It has a rectangular backplate and a reflector. No. 211 is of somewhat similar design, but is intended mainly for mirrors and for use as a bed light, a pendant push switch being provided. As in the case of the other reflectors chromium or sprayed colour finish can be obtained. Another new-comer in this range is No. 804.

Street Surface Brightness Meter

A simple brightness meter of the visual matching photometer type has been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, for street lighting work. It is not intended for high precision measurements, but readings should be obtainable to within plus or minus about 20 per cent.

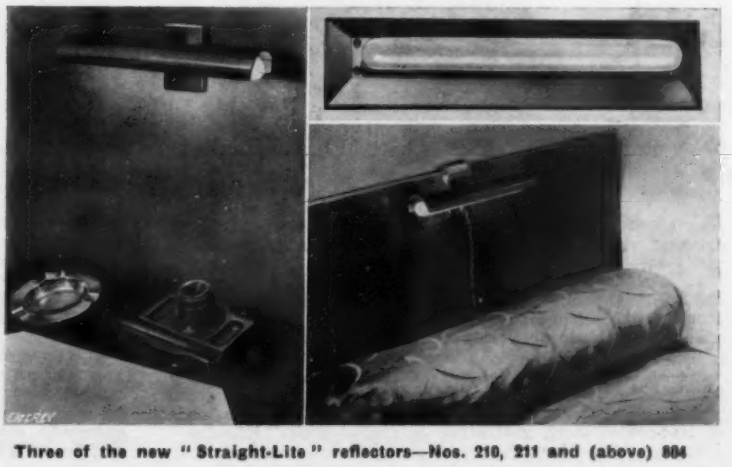
The instrument consists of a rectangular metal box with a long horizontal window through which the observer looks at the street, and sees superimposed upon it a row of small spots of increasing brightness. The scale of brightness appears in front of the spots and the rheostat knob should be adjusted so that the voltmeter pointer is exactly at the required scale setting. The ranges available (for lighting by tungsten filament lamps) are 0.2 to 8.02 to 0.8 equivalent ft.-candles, and 0.002 to 0.08 e.f.-c. Having selected the point on the road surface of which he desires to measure the brightness, the observer looks at the point with one eye and moves the instrument until he finds a spot on the scale the brightness of which is as nearly as possible equal to that of the point on the road surface.

The spots in the instrument reflect a translucent window which is so illuminated by a small lamp as to be brighter at one end than the other; the lamp is supplied by a small dry battery through a variable resistance. For judging high-pressure mercury vapour discharge lamp installations a blue filter is inserted in a slot in the instrument, which gives a convenient colour match.

Study Lamps

Study lamps are to form a special feature of a campaign to be launched shortly by the Electric Lamp Manufacturers' Association, and in connection therewith the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, and MESSRS. SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38/39, Upper Thames Street, London, E.C.4, are introducing special lamp standards designed to provide a good working light rather than decorative illumination. The new "study" type gives really good intensity up to a distance of at least 3 ft. or more from the base of the standard; prevents bad brightness contrasts by allowing at least 50 per cent. of the total illumination from the lamp to be directed upwards on to the ceiling, thus throwing soft diffused light over the whole room; and by having interior and exterior shades of correct materials, ensures that the surface brightness of any part of the outside of the shade shall be of low intensity.

The form in which this lamp is to be marketed by the G.E.C. comprises a base either of wood or metal on which is mounted a b.c. holder and gallery supporting an inverted



Three of the new "Straight-Lite" reflectors—Nos. 210, 211 and (above) 804

"Superlux" shade, from which is hung an outer shade of imitation vellum or similar material lined with a white substance

The new Siemens and G.E.C. study lamps

of high reflection factor. The standard is designed for use with a 100-W pearl coiled-coil lamp. The correctly proportioned height from the table and diameter of the outer shade ensure that the light is distributed over a sufficiently wide area around the base of the standard, while the use of an internal diffusing glass shade means that if anyone is looking up under the edge of the outer shade they will still see no unduly bright light.

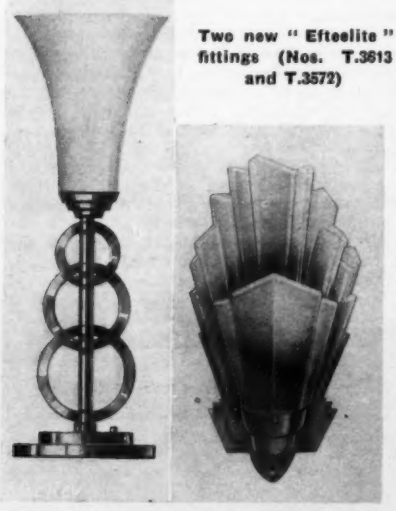
The Siemens lamp is designed on similar lines. It measures 19 in. up to the lampholder nipple and has a 7-in. diameter weighted base. It also incorporates an opal glass dispersive type shade and an outer reflecting shade 17 in. in diameter and 8 in. deep. Two models are available, one incorporating a metal base and the other an ebony-black wooden base. Both have chromium-plated stems.

The "Parklite" Clock

So that drivers need not worry about switching on their car lights when the vehicle is left outside a house in the evening, MESSRS. S. SMITH & SONS (MOTOR ACCESSORIES), LTD., Cricklewood Works, London, N.W.2, have introduced the "Parklite" clock, which incorporates a standard "Empire" electric movement as well as a time switch that can be set by a small flexible knob at the bottom. It is interchangeable with standard Smith or Jaeger key-wind clocks and can be driven from either a 6 or 12 V battery.

Efteelite Lighting Fitting

We have just had an opportunity of inspecting a large number of new designs of "Efteelite" lighting fittings which MESSRS. FREDK. THOMAS & Co., LTD., 189 and 191, Drummond Street, London, N.W.1, have just put on the market. We were particularly interested in a range of stove-enamelled brass designs available in a wide variety of shapes, sizes and finishes. The sprayed glass shades can be supplied to harmonise with any colour scheme, and the tints can be made still more attractive by what is called the "Radiance" and "Goldensheen" treatment.



Two new "Efteelite" fittings (Nos. T.3613 and T.3572)

A speciality of the company which is now finding considerable favour is its patented split cylinder which is completely dust-proof and can be built up easily into any number of combinations both vertically and horizontally. Many of the totally enclosed fittings incorporate the "Eftee-grip," an ingenious device which facilitates removal of the shade for cleaning, &c.

Special fittings for various purposes, such as X-ray and photographic work, form quite a large part of the company's work and there is at present on view at its showrooms a number of fittings specially designed for the London Midland and Scottish Railway station at Wembley. These are made of lead-coated steel, gold stove enamelled with "Efteelite" diffusing glass. Even the lowest-priced designs are dealt with individually and are solidly constructed of high quality materials. We are informed that Messrs. Thomas are considering the extension and complete rebuilding of their factory.

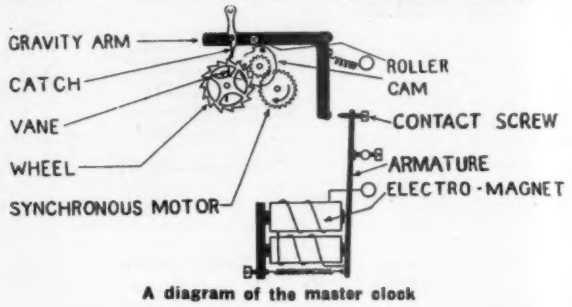
The "Synchronomains" Master Clock

One of the good results of time-controlled grid frequency has been the attention it has directed to the use of a.c. mains-driven synchronous motors in place of self-contained master clocks for operating the impulse circuit slave dials installed in so many large buildings and institutions.

The accuracy of this method of time-keeping, since it is under constant supervision and checked with Greenwich Mean Time, is bound to become superior to the performance of individual master clocks, which are largely unattended.

For such installations the "remontoire" transmitting switch is claimed by the SYNCHRONOME CO., LTD., 32-34, Clerkenwell Road, E.C.1, to have certain merits and practical advantages for impulsing the slave dial circuits. These virtues can be retained while dispensing with the pendulum by means of an arrangement devised by Mr. F. Hope-Jones.

In place of the pendulum he substitutes a synchronous motor, as shown in the accompanying illustration which turns



A diagram of the master clock

a cam once every two seconds. This carries a pin which acts like a one-leafed pinion and picks up the familiar 15-toothed wheel one tooth at a time, achieving the release of the switch lever every half-minute and letting it down gently on the cam into contact at a speed quick enough to prevent preliminary sparking, yet not so quickly as to cause a bounce. "Battery warning" is retained in the form of assistance rendered by the motor to raise the switch arm if the magnet is unable to do so unaided. Concealed behind the dial there is a particularly neat little device which automatically substitutes the mains a.c. supply in case of breakdown. The instrument is known as the "Synchronomains" master clock.

Hand-regulated Water-heaters

A range of electrode water-heaters for loadings up to 100 kW has been developed by MESSRS. A. REYROLLE & CO., LTD., Hebburn-on-Tyne, to meet the demand for small-capacity semi-automatic equipment for heating buildings of suitable size, such as large private houses, small hotels, shops, garages, and greenhouses.

The Reyrolle hand-regulated water-heater

The electrode principle of water-heating, which is applicable to alternating-current heaters, utilises the water itself as the heating-element, and some of its advantages are that there are no elements to burn out, efficiency is consistently maintained at a high value (about 98 per cent.), and the absence of concentrated transfer of heat through the shell avoids local hot-spots which engender scaling and shorten the life of the boiler.

Hand-operated load regulation down to 50 per cent. of full load is provided, and the switchgear usually consists of a contactor and an isolating-switch, with the necessary protective-apparatus and indicating instruments. They comply in every respect with the relevant clauses of the I.E.E. Wiring Regulations.

The current can be switched on and off automatically by means of an adjustable thermostat to maintain the desired air-temperature in the building, and time-switch control can also be used. For larger requirements, a complete range of fully automatic electrode water-heaters is available with loadings of from 50 kW upwards.

The Chinese Electrical Market

IN his report on the trade and economic conditions in China Mr. A. H. George, Acting Commercial Counsellor at Shanghai, points out that many of the difficulties with which China has had to contend since 1931 have not been of her own creation. The balance of payments, which has turned against her, was due rather to world conditions. It is some years since China began to put her house in order, and while the record of achievement is comparatively small, there is now a greater security and stability in the country than there has been for many years.

Dealing with the trade with the United Kingdom, Mr. George states that produce and manufactures to a total value of £6,514,400 were exported to China in 1934, and merchandise to the value of £6,142,610 was imported from China in that year. In addition, domestic exports from the United Kingdom to Hong Kong were valued at £2,512,629, and imports consigned from Hong Kong were valued at £421,732. Imports of prime movers are subject to great fluctuations, due to the execution of individual projects. The largest contracts placed recently have gone to Germany, which in 1934 secured three contracts for turbo-generator sets of 15,000 kW each, and one for a 10,000 kW set; United Kingdom firms in 1934 secured one contract for a 500 kW set and one for a 250 kW set. The principal supplier of electric transformers and parts and of miscellaneous electrical machinery, was the United Kingdom. These supplies, however, do not include dynamos, generators and parts (valued in 1934 at $1½ millions), and electric motors and parts (valued in 1934 at $2 millions), the bulk of both of which came from Germany.

Germany and Japan each supply about 15 per cent. of the imports of electric cables. Though there have recently been signs that the rapid rate of expansion of this market has not been maintained, the increased popularity of electricity makes it certain that large supplies of electric cables will continue to be required. In 1933 and 1934 Germany was the chief supplier of telephone and telegraph instruments, with 35 per cent. of the total imports in 1934; Belgium provided 24 per cent. and the U.S.A. 13 per cent. Imports from Belgium in the first quarter of 1935 were valued at over $500,000, compared with $20,000 in the first quarter of 1934. Imports from Japan, Sweden and the U.S.A. also showed small increases in the first quarter of 1935, while those from the United Kingdom and Germany declined. The United States is the largest supplier of radio sets and parts, though the value of American exports to China in the first quarter of 1935 declined, as was also the case with imports from Germany; imports from the United Kingdom and Japan showed increases over the corresponding period of 1934. There is a growing market in China for radio sets and parts.

Dealing with the mineral resources of the country Mr. George states that tungsten is principally produced in Kiangsi, but also in Kwantung and Hunan. The output of ore in China represents over 60 per cent. of the total world production, and almost the whole output is produced for export. In 1918 the output was 10,000 tons of which 9,400 tons was exported. Exports and output have fluctuated considerably in the past few years and in 1934 the exports totalled 4,432 tons, and prices were the highest recorded in recent years.

Considerable progress has been made during the last two years in connection with the extension of radio-telegraph, telegraph and telephone services in China, and it is proposed to introduce radio-telephone services. Direct radio-telegraph communication has been established between Shanghai, San Francisco, Berlin, Paris, London, Tokyo and Rome, and radio-telegraphy is also growing in popularity for internal communication, and large contracts have been placed with United Kingdom manufacturers for equipment for high-speed radio telegraph stations. Experiments are being made with a view to inaugurating radio-telephone services between China and Europe and America, and, internally, between important cities in China. It is expected that both foreign and domestic services will be in commercial operation by the end of the current year.

Equally rapid progress is being made in the expansion of local and trunk telephone lines. Equipment in the large centres is being modernised and automatic systems installed, and the completion of the nine provinces trunk telephone system is expected this year.

Activities at Heaton

TURBO-GENERATORS still form the chief output of Messrs. C. A. Parsons & Co., Ltd. The largest now going through the Heaton shops are the two 51,500-kW sets for Hams Hall station, Birmingham, and a 30,000-kW 36-kV turbo-alternator for Northampton has passed its shop tests. A second 36-kV alternator has been ordered to replace a lower-voltage machine at Upper Boat station (S. Wales Power Co.); this brings the total number of Parsons h.v. concentric-conductor alternators to eleven (330,000 kVA), including the two for Tir John (Swansea) and a third set for Salt River (Capetown). A 22-kV 20,000-kW set has also been put into commercial service recently at the East Rand station.

The 25,000-kW unit being erected at Southampton is of the same design as the new set at Hull, which was described in the ELECTRICAL REVIEW of November 1st, and is remarkable for the large output from a single-cylinder machine at 3,000 r.p.m. A duplicate is on order for Southampton. Of similar type is a 27,500-kW 3,000 r.p.m. machine for India.

The 20,000-kW, 22-kV Parsons turbo-alternator set supplied to the East Rand Proprietary Mines

Other orders in hand for overseas include a two-cylinder 25,000-kW unit (600 lb. per sq. in.) for Western Australia, 12,500-kW for Port Elizabeth (S.A.), and 15,000-kW for Wellington (N.Z.). The last is a stand-by to a hydro-electric plant and is designed to be started up and put on full load within ten minutes. It is similar to the 600 lb. per sq. in. turbo-alternator installed during the year at the Runcorn works of Imperial Chemical Industries, Ltd.

Among the many industrial sets under construction is one of 5,000-kW at 3,600 r.p.m. for the Ford Motor Co. of Canada. Steam conditions will be 800 lb. per sq. in. and 800 deg. F., and exhaust will be against a back pressure of 200 lb. per sq. in. The alternator winding connections can be changed on site to give either 13,200 or 4,000 V.

The smaller turbines for industry are almost always of the pass-out type with a gear-driven generator, many being of the "Uniplane" design which requires no basement for the condenser. All new machines are being fitted with anti-corrosive shields to protect the blades at the l.p. end from the cutting effect of wet steam. Higher blade speeds are now obtainable with hollow blades, which are manufactured by a milling process and are integral with their root pieces.

Activity is considerable in the transformer department, where units up to 75-kVA are being built in large numbers for rural schemes. The larger examples include a 15,000-kVA transformer with on-load tap-charging gear for the C.E.B. for use as a spare for several sub-stations, the voltage being stepped down from 66 kV to either 11, 6 or 2.2 kV. A 2,800-kVA set for electric furnace work (British Acheson Electrodes) has a low-voltage output of 40,000 A. It is equipped with on-load regulating gear and is mounted on a motor truck. The recently introduced automatic voltage regulating apparatus is being fitted to many transformers on order.

Floodlights embodying a trough form of parabolic reflector for aerodromes at home and abroad are a notable development of the Mirror Department.

New Books

Elementary Electrical Engineering (second edition). By A. E. CLAYTON and H. J. SHELLEY. Pp. 462; figs. London: Longmans, Green & Co. Price 7s. 6d.

Few books on electrical technology have established themselves so quickly and so firmly as this one. First published eight years ago, there have been five new impressions, and now a second edition appears.

As regards the subject matter in the first edition, the authors have been well advised to leave well alone, and to bring in the new matter required to keep the book up to date. Consequently, in addition to revision, we now see much more attention given to alternating current work, including circuits, systems, machines, rectifiers and discharge tubes. The mode of treatment of the new matter follows closely that of the earlier materials which has proved so acceptable to teachers and students alike.

The book gives just about the correct amount of information required for a general knowledge of elementary electrical technology, and is therefore suitable not only for junior electrical engineering students, but also for students in other branches of engineering. The real difficulty arises from the total quantity of material, for even the outline of the subject has almost become too extensive to be covered in any ordinary course. At the same time, the new matter is essential, because it is useless to recommend to the elementary student specialised books on modern developments or new appliances. The best solution to the difficulty seems to be the one adopted by the authors: to adhere strictly to principles and to leave the use of the material to the teacher. The student can then supplement his reading as he thinks fit.

As a textbook covering the groundwork of any reasonable course in electrical engineering nothing better could be desired, while the large number of numerical examples with answers will add to the teacher's appreciation.

Tools of To-morrow. By J. N. LEONARD. Pp. 299. London: G. Routledge & Sons, Ltd. Price 12s. 6d. net.

In this volume the author has ably summarised recent developments in many branches of science, and discusses in a popular manner how these may influence human progress. An attempt is made to give the background of machines by tracing their history briefly. After a short survey of the role of power, the author deals with the various sources of energy, including a study of data relating to the world's coal and oil supplies, hydrogenation and the technical aspects of water power problems.

Reference is made to the effect of constantly improving electrical transmission in bringing remote power sites nearer to their markets, *e.g.*, as seen in the harnessing of distant rivers such as those of the Canadian Rockies and Labrador. A valuable section is devoted to a consideration of tidal power problems, incorporating a general résumé of the three methods applied in dealing with tidal intermittency, i.e., connecting the tidal station with a super-power network, pumped-storage methods and multiple reservoir systems. In discussing the Severn Barrage Scheme Mr. Leonard states that "just above Bristol there is a narrow constriction through which the tide boils like a mill race." In spite of long acquaintance with the district, we have not observed this "boiling" phenomenon.

Subsequent sections are devoted to metal resources, scientific prospecting, recent accomplishments in metallography, and a general study of transport and communication devices. The limiting effect of transport difficulties upon mass production industries is explained, and a brief review is given of the prospective improvements in highway transport. The author's view is that the civilised world contains everything it needs in great abundance, that there is almost unlimited power available, and that material conditions are favourable to a vast improvement in the conditions of civilised life.

Shorter Notices

"Hand Book of Chemistry and Physics." Pp. 1,951. Cleveland, Ohio: Chemical Rubber Publishing Co. $6. English Agents: Arthur Bird or A. Harvey.—The twentieth edition of this handbook has been revised in important respects and contains a considerable amount of new material. The table of physical constants of organic compounds, now included, is claimed to be the largest and most accurate presented in a low-priced book, the nomenclature for which was worked out by Dr. A. M. Patterson in accordance with the rules of the International Union of Chemistry. The section on X-ray spectra has been revised in conformity with recent determinations, and there are fifty pages dealing with electrical constants, thermo-electricity and electro-chemical equivalents.

"Practical Electric Cable Jointing." By W. Maskery. Pp. 120; figs. 35. London: Technical Press, Ltd. Price 5s. net.—A perusal of this book leaves us with the conviction that Mr. Maskery is an excellent plumber jointer who "setteth his mind to finish his work and watcheth to polish it perfectly." As an author, however, he is hardly as successful. He gives very full extracts from works of earlier writers, and looks upon "those readers who consider his book a waste of time as a sect who delight in decrying any work which varies or differs from their own pet theory, and who belong to that class who are conventional, orthodox, and conservative because of their moral lethargy and mental indolence."

"Principles of Mechanism," by F. Dyson (Second edition). Pp. 323, figs. 161. London: Oxford University Press. Price 12s. net.

"Noise: A Technical Résumé." By L. E. C. Hughes, Ph.D. (8 pp). London: The Anti-noise League. Price 1s.—This is a reprint of a series of short articles dealing with twelve different aspects of the subject of noise and its prevention or abatement.

Parliamentary News (BY OUR SPECIAL REPORTER)

ON December 5th Mr. Day asked the Postmaster-General whether he could state the amount to date which the British Broadcasting Corporation had foregone out of its total revenue from wireless licences, and which public funds had benefited following the recommendations of the May Committee on national expenditure.

Sir E. Bennett, who replied, said that the amount which the B.B.C. had foregone voluntarily was £637,500. This sum had been retained by the Exchequer as part of the national revenue.

Police Wireless

Mr. Day asked the Home Secretary on December 5th whether his department had now decided to set up a national wireless installation for the purpose of circulating details of grave crimes to mobile police squads operating throughout Great Britain, together with the descriptions of wanted persons for these crimes; and if he could give particulars of the further development of wireless which was contemplated in the aid of police work.

Sir J. Simon said he hoped it would eventually be possible to institute a system of regional schemes providing for communication by wireless between a central station and mobile units over a radius of thirty to forty miles, and that these schemes, with the scheme already in operation in the Metropolitan Police District would, when fully developed, cover most of the country. Considerable progress had already been made with one regional scheme, but this was not yet in full operation, and the general development of the system would not be possible until further experience had been gained.

The Central Board's Accounts

Mr. Liddall asked the Minister of Transport on December 9th whether he could arrange that in future the accounts of the Central Electricity Board could be published in rather greater detail, and in particular that the accounts of each electricity area should be shown in sufficient detail in order that the working results of each area might be fully disclosed.

Mr. Hore-Belisha said that as the Central Electricity Board was charged with the duty of constructing and working a transmission system for the country as a whole on a national basis, and any division into areas was consequently made by the Board on technical rather than on financial grounds, the only result of the suggestion would be to elaborate the accounts on a basis which ran counter to the whole principle of the scheme.

The Report on Distribution

On December 9th Captain Cazalet asked the Minister of Transport whether the Committee appointed to inquire into the distribution of electricity had completed its Report.

Mr. Hore-Belisha replied that it had not.

Captain Cazalet asked if the Minister could expedite the report, and Mr. Hore-Belisha said that the field of the Committee's inquiry was a large one. He was sure the Committee would report with the utmost expedition that the facts enabled it to do.

"S.V.P." Telephone Service

Mr. Day asked the Postmaster-General on Tuesday last whether his attention had been called to, and if he had received any reports on, a new service which had been introduced for the convenience of subscribers on the Paris telephone exchanges whereby on the telephone subscriber dialling "S.V.P." the operator would switch the caller to an information service which would answer any reasonable questions; and would he consider affording the same service and advantages to London telephone subscribers.

Major Tryon said that his attention had been drawn to this new service, and he was making inquiry into its working with a view to considering whether its introduction, in its present or in a modified form, into this country was practicable and desirable. The Paris service was operated by a private company though access to it was obtained through the Post Office telephone system.

Wireless Licences

On December 10th Major Tryon told Mr. Day that the number of wireless licences in force on November 30th, 1935, was 7,369,573.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The British Industries Fair

The Advisory Committee for the Electrical Section has made the following provisional arrangements for official visits to the Birmingham Section of the British Industries Fair by associations connected with the electrical industry:—

Tuesday, February 18th.—Luncheon.
Institution of Electrical Engineers (Council).
Incorporated Municipal Electrical Association (Council).
British Electrical Development Association, Inc. (Council).
Incorporated Association of Electric Power Companies.
Provincial Electric Supply Association.
London Electricity Supply Association.
Electrical Contractors' Association of Scotland.
Electrical Contractors' Association, Inc. (Provincial).
Electrical Wholesalers' Federation (Provincial).
Thursday, February 20th.—Tea.
Electrical Association for Women (Birmingham & Midlands Branch).
Friday, February 21st.—Luncheon.
Association of Mining Electrical Engineers.
Saturday, February 22nd.—Luncheon.
Electrical Power Engineers' Association.
Electrical Association for Women (Demonstrators' Circle).
Tea.
Students' Section of the South Midland Centre of the Institution of Electrical Engineers.
Tuesday, February 25th.—Luncheon.
Institution of Electrical Engineers (South Midland Centre).
Incorporated Municipal Electrical Association (Provincial Centres).
British Electrical Development Association (Provincial).
Association of Supervising Electrical Engineers.
Illuminating Engineering Society.
Association of Steel Conduit Manufacturers.
Association of Consulting Engineers, Inc.
Municipal Tramways and Transport Association, Inc.
Tramways, Light Railways and Transport Association.
Electrical Contractors' Association, Inc. (Council).
Electrical Wholesalers' Federation (Council).
British Electrical and Allied Manufacturers' Association.

Anglo-Italian Trade

"Italy as a Buyer from the British Empire" is a title of a 28-page pamphlet issued by the Italian Chamber of Commerce in London. The prevailing situation has led to the publication of this summary of the course of trade in recent years, whose purpose is to show that for some time past on balance British-Italian trade has been in favour of Britain, and to suggest that the friendly atmosphere which has long surrounded such trade may at an early date play a part in paving the way towards a resumption of normal business.

The Christmas Holidays

Christmas necessitates our publishing the next two issues a little earlier than usual and our Advertisement Department asks us to state that classified advertisements for our December 20th issue should be received by 5.30 p.m. on Monday, December 16th. For the following week such advertisements should be sent to arrive not later than first post Monday, December 23rd.

Spinning Mill Lighting

A particularly good example of spinning mill lighting is to be found at the Stobswell Works of the Buist Spinning Co.

The spinning mill of the Buist Spinning Co., illuminated by "Ediswan" lamps

in Dundee, where 600 "Ediswan" L.S. 611 dispersive reflectors fitted with 250-V 100-W "Royal Ediswan" pearl lamps have been installed. As our picture shows, good, even distribution of light has been obtained. The lamps and fittings were supplied by the Edison Swan Electric Co., Ltd., the 17,000 yd. of Edison Swan 3/.036 C.M.A. 600 meg. cable by Edison Swan Cables, Ltd., and the installation was carried out by Messrs. R. M. Lindsay & Co., of Dundee.

A Travelling Showroom

The accompanying illustration shows a travelling showroom which the Lytham St. Annes Electricity Department is using in its rural area. This vehicle has just completed a tour, the principal object being to show the "Reyrolle" electrode steam

The Lytham St. Annes travelling showroom

raiser for use on farms coming under the Milk Marketing Board. In sending us the photograph Mr. J. C. Fairchild, the borough electrical engineer, states that the vehicle has proved to be of great use to the undertaking due to the fact that the majority of the consumers in the rural area are too far away from the central showrooms. He finds that if goods are taken to the customer business can be done.

The Glasgow Plant Contracts

The General Electric Co., Ltd., recently appealed to the Glasgow Corporation against the decision of the Electricity Committee recommending the acceptance of the tender of Messrs. C. A. Parsons & Co., Ltd., for the supply of two turbo-alternators and condensing plant for Dalmarnock power station at a cost of £353,770. The G.E.C. stated that its tender was many thousands less, and that it had quoted according to the same specification as the recommended tenderer. It also gave adequate guarantees with heavy monetary penalties to produce the stipulated requirements. The company quoted figures showing the large amount of money that it has been in the habit of spending in Glasgow and in Scotland generally for some years past. The letter is to be considered at the next meeting of the Corporation.

Last Friday the Electricity Committee had the tenders under further consideration, the Council having at its last meeting agreed to defer consideration of the matter pending a report from the manager of the Electricity Department. It was stated after Friday's meeting that two firms had quoted prices of £319,964 and £327,946 respectively, and that the manager's report on the different tenders was being prepared for submission to the Corporation's next meeting.

The Ironmongers' Electrical Section

The *Ironmonger* reports that at a recent meeting of the Electrical Section of the Ironmongers' Federated Association the subject of municipal trading was discussed. One member suggested that the best means of combating this was to secure the election of fellow traders to the electricity committees. Mr. E. B. Holloway, the hon. secretary, considered that the interests concerned should co-operate in sending a petition to the Government on the matter. A resolution in the following terms was proposed: "That this Federation appeals to the Electricity Commissioners that wherever electrical showrooms are established they shall be for the benefit of traders rather than for the benefit of those distributing electricity."

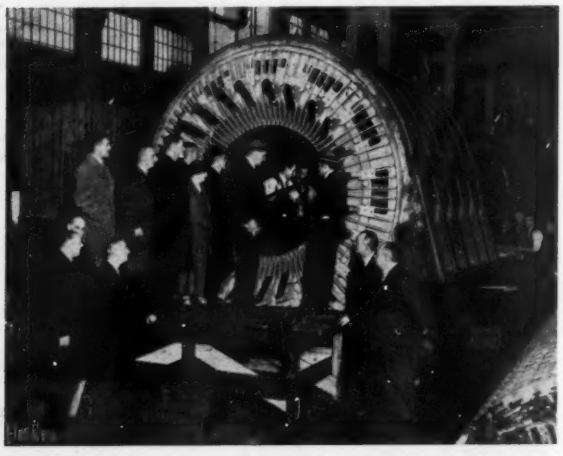
Correspondence with the N.E.C.T.A., Ltd., was read and a resolution was passed that "The Electrical Section of the I.F.A. are prepared to co-operate with N.E.C.T.A. in every way for the good of the trade, but they must insist upon individual representation as an Association upon the Fair Trading Council."

Speaking at a meeting of the Birmingham and Midland Ironmongers' Association on December 3rd, Mr. Holloway appealed to members to make good displays of electrical goods and, if possible, to set up separate electrical departments. The *Ironmonger* says: "He warned members that unless they now made a stand and displayed electrical appliances there

might come a time when they would be unable to handle those goods." The president of the Association suggested that some members might with advantage discontinue some lines and replace them by electrical goods.

Works Visits

The Birmingham Electricity Supply Committee recently visited the Witton engineering works of the General Electric Co., Ltd., at Birmingham, and during the tour of the works



Members of the Birmingham Electric Supply Committee inspecting a large alternator at the Witton works of the G.E.C.

inspected the two new 62,500-kVA alternators which are being constructed for Hams Hall Power Station. The accompanying illustration shows Dr. A. H. Railing, director in charge of the Witton group of factories, explaining to the visitors the features of design of one of these alternators. In the group may be seen Councillor H. B. Sale, chairman of the Works Sub-Committee, Alderman A. E. Ager, chairman of the Finance Committee, and Mr. F. Forrest, chief electrical engineer.

Members of the Lothians and Fife branches of the Association of Mining Electrical Engineers paid a combined visit to the B.E.P. Works of the Harland Engineering Co., Ltd., at Alloa on December 8th. Included amongst the 220 visitors was a number of engineer apprentices of the Fife Coal Co. Members of the Harland staff conducted the visitors round the works, where a number of machines were at work, and explained the various processes in the manufacture of pumps, motors and switchgear. After tea had been served in the canteen a cinematograph film dealing with tests of high tension switchgear was exhibited and explained. Short speeches were made by Mr. Kemp, a director of the Harland Co., and by Messrs. McLennan and McNeil, the presidents of the Lothian and Fife branches of the Association respectively.

For Sale

Mr. E. J. J. Lane will sell by auction on December 18th, at 13, High Holborn, electrical and radio goods. (See our classified advertisements.)

Modern Store Lighting

The new store of Messrs. W. S. Woods, Ltd., Colwyn Bay, is an excellent example of modern design in shop fitting and

The store of Messrs. W. S. Woods, Ltd., illuminated by means of Holophane reflectors

the architect, Mr. C. Foulkes, has embodied the latest developments in arcade style of windows. The lighting is by means of Holophane recessed dome window reflectors which fit flush with the ceiling of the windows, thus ensuring a neat and efficient finish. The interior of the premises is illuminated by means of indirect lighting from the top of the showcases and shelves. Light is projected on to the ceiling from inverted Holophane reflectors fixed on top of the shelves and showcases and focused to cover the ceiling area uniformly. Our picture illustrates one of the windows.

Contractors' Dinners

The Lord Mayor of Cardiff (Alderman G. Fred Evans) attended the annual dinner of the Cardiff branch of the Electrical Contractors' Association (Inc.) which was held at the Royal Hotel, Cardiff, on December 5th, with Mr. W. J. Creemer in the chair. Proposing the toast of "The Electrical Contractors' and Allied Associations," Alderman Evans said that, as members of the Association, those present had always carried out to the letter—and sometimes beyond—the requirements of the Corporation, which was satisfied in every way. In responding Mr. A. G. Bruty (president) emphasised that the main desire of the Association was to raise the status of the electrical contracting industry as a whole. The toast of "The Other Sections of the Industry" was proposed by Mr. R. W. Kennedy, the responders being Mr. P. Thomas (president, R.I.B.A.) and Mr. E. Jones (Cardiff City electrical engineer). Mr. C. D. James (chairman of the Western Section of the E.C.A.) proposed "The Chairman," and Mr. Creemer responded.

At the annual dinner of the Electrical Contractors' Association (Newcastle Branch) held at Newcastle-on-Tyne on December 6th, Mr. A. G. Bruty (president), replying to the toast of "The Association," proposed by Mr. N. S. Tennant (Newcastle and District Electric Lighting Co., Ltd.), said that electrical contractors could offer authorities the whole of their organisation free of charge for the purpose of loading the national grid system. Mr. Tennant referred to the friendly relations and community of interests between the electricity supply authorities and the electrical contractors and said that the contractors were pioneers in the education of the consumer.

The Hotpoint Showrooms

The showrooms of the Hotpoint Electric Appliance Co., Ltd., at 24, Newman Street, Oxford Street, London, W., have recently been redecorated. The front part of the show-

The redecorated showrooms of the Hotpoint Electric Appliance Co., Ltd.

rooms, devoted to the display of a complete range of small electrical appliances for the home, is a representation of a pine-panelled room, the mellow tone being relieved by touches of black and sealing-wax red in the columns, hangings and seating, while the floor is covered with a neutral beige carpet. The show cases, of simple design, are of oak with the tops and shelves of armoured plate glass; this allows an uninterrupted view of the contents and remains undamaged by the movement of the heavy utensils displayed upon the polished surface. Particular attention has been paid to the lighting, the fittings being unobtrusive. The back part of the showrooms has been devoted to the larger appliances, such as cookers, washing machines, &c., and it has been laid out as a model kitchen.

Fifty Years and Still Running

We are indebted to Messrs. Crompton Parkinson, Ltd., for a photograph of what is thought to be the oldest dynamo still in regular use. It is believed to have been made fifty years ago and has been in constant use in connection with the lighting of Sulham Rectory, near Pangbourne, Berks. It still runs for anything up to five or six hours per day. The plant was installed by the brother of the Rev. H. C. Wilder, who lives at the rectory; the brother was a pupil of Col. Crompton. We understand that the machine still puts up a good performance and looks fit for another spell of service. Does anybody know of an older dynamo or one with a similar record that is still running?

New B.B.C. Studios

With reference to the description of the new studios of the B.B.C., which was published in our issue of November 1st, page 611, Messrs. Smith & Hammond, Ltd., inform us that

they were the electrical contractors for the scheme on both sections, the whole of the electrical installation, including the technical wiring, taking over twelve months to complete, and giving employment to a large number of electricians.

Social Events

The annual dinner and dance of the Blackburn Electricity undertaking Sports and Social Club was held on December 6th. Mr. R. H. Harral, the borough electrical engineer and club chairman, said 1935-36 would mark a record in the history of the undertaking. All previous load records and of consumers supplied were being surpassed, and he thought there would be a further reduction in tariffs. These results had been achieved by the co-operative efforts of employés and Committee who had backed them up. Councillor G. B. Eddie, vice-chairman of the undertaking, said much of the success was due not only to the ability of those at the head, but to the fact that there had been the right spirit among the employés. Alderman C. A. Critchley, J.P., Deputy-Mayor and chairman of the Committee, who is president of the Club, said the Department was no longer the "Cinderella" of Corporation undertakings. On behalf of the club he presented Mr. E. Porter, J.P., a former vice-chairman, with an electric standard lamp. Among the guests were Mr. W. A. Royle, former electrical engineer, now the electrical engineer at Sunderland, members of the Electricity Committee, and a number of representatives of manufacturers and contractors.

The accompanying photograph shows the cast of "Baa Baa Black Sheep," of which a private performance was given before members of the staff of the Lancashire Electric Power Co., from all parts of its area on four nights from Tuesday to Friday (December 3rd-6th). At the final performance Mr. J. Purrett, assistant engineer and manager, in the absence of Mr. C. D. Taite, congratulated the cast, the producer, and all concerned upon the high standard of the performance.

Members of the staff of the Lancashire Electric Power Co. in a scene from "Baa Baa Black Sheep"

Long-service Cable

W. T. Henley's Telegraph Works Co., Ltd., has sent us a photograph of a piece of its house wiring cable which was installed in Bedford Girls' High School in 1896. This is 7/.036-in. p. and v.i.r. taped and braided cable and was recently removed when alterations were being made. Cable of the same age, undisturbed by the alterations, was left to give further service. Even after thirty-nine years the piece of cable recently stood up to a satisfactory test, although naturally the insulation had aged.

Calendars and Diaries

The calendar received from the Mullard Wireless Service Co., Ltd., is in the now familiar form of a cut-out of one of the company's valves, and the charming blonde enshrined in it is a worthy successor of the Mullard girls of previous years.

Illustrations of some of the oil engines produced by the company appear on the calendar of Messrs. Ruston & Hornsby, Ltd., which has monthly sheets with bold figures.

The diary sent to us by the Electrical Power Engineers' Association is neatly bound in dark blue limp leather and in addition to the usual diary information it contains a number of tables and data of use to electricity supply engineers. There is a pocket at the back for a season ticket.

The Smithfield Show

From the electrical point of view interest at the Smithfield Club Cattle Show now being held at the Royal Agricultural Hall, Islington, London, centres largely on refrigeration equipment. An open refrigerated display counter called the "Frigoplate," a Danish invention of which Frigidaire, Ltd., has just become the sole concessionaire in this country, has big possibilities for the attractive display of perishable goods such as meat, fish and pastries. For use in grill-rooms, &c., the Lightfoot Refrigerator Co., Ltd., has an enclosed show counter with a sliding glass top, hinged table flaps, and refrigeration space both above and below the display tray. Cold rooms, display counters and refrigeration equipment generally are also shown by Messrs. J. & E. Hall, Ltd.; the International Refrigeration Co., Ltd.; the Smithfield Refrigerator Co., Ltd.; Ernest West & Beynon, Ltd.; York Shipley, Ltd., and Aveling-Barford, Ltd. The last-mentioned company also has on view its new 27 cu. ft.-capacity electric sterilising chest (described in our issue of November 1st, page 607), bottle filling and washing machines, &c. Milking machines, &c., are represented by Messrs. Gascoigne's (Reading), Ltd.; Vaccar, Ltd.; and the Alfa-Laval Co., Ltd.; while Messrs. A. Grabham & Co., Ltd., have bottle-washers and Messrs. James Stott & Co. (Engineers), Ltd., electrically heated sterilisers. Engines and pumps of various kinds are shown by Petters, Ltd.; Bamfords, Ltd.; R. A. Lister & Co., Ltd.; Parker, Winder & Achurch, Ltd.; Blackstone & Co., Ltd.; Thomas & Son (Worcester), Ltd.; W. H. Willcox & Co., Ltd.; and H. J. Godwin, Ltd. The electrically heated seed cultivation cabinets of British Cultivations, Ltd., have been considerably improved and now produce 12 in. of green fodder in six days. Among other electrical exhibitors are the Wolseley Sheep Shearing Co., Ltd.; Ransomes, Sims & Jefferies, Ltd. (agricultural equipment); H. W. Stephen (incubators); Herbert & Sons, Ltd.; the Hobart Manufacturing Co., Ltd.; and the Peerless Electrical Manufacturing Co., Ltd. The last three companies all show mincing and similar machines. The exhibition closes to-day (Friday).

An illuminated arch which has been erected on the occasion of the Romford Shopping Week

Modern Flour Mill Driving

In the article under the above heading in our issue of December 6th, the h.p. truck-type switchboard was stated to have been supplied by the English Electric Co., Ltd. Messrs. Crompton Parkinson, Ltd., write to say that this particular switchboard was supplied by them, as many engineers will probably be able to recognise from fig. 2 on p. 773.

Electric Gas Metering

The new coke ovens erected in connection with the Orgreave by-product plant of the Rothervale Collieries, which are owned by the United Steel Companies, Ltd., of Sheffield, are being equipped with three "Thomas" gas meters constructed by the Cambridge Instrument Co., Ltd. One meter is for measuring the producer gas supplied for heating the coke ovens and will have a maximum capacity of 800,000 cu. ft. per hour, with a 24-in. diameter meter housing. The second meter, for the coke oven gas delivered to the gas-holder, will have a capacity of 500,000 cu. ft. per hour, with a 20 in. diameter housing, and the third meter, for surplus coke oven gas used in the coke ovens, will have a capacity of 300,000 cu. ft. with a 16 in. diameter housing. Each meter comprises a housing inserted directly in the pipe line and electrically connected to a regulator and an instrument panel. The regulators and instrument panels in this installation are to be accommodated in a centralised control room which is over 300 ft. from one of the meter housings. Each regulator is fitted with an automatic cut-out switch which operates when the total gas passing falls below a minimum flow, and starts the meter again when the flow recommences. These meters have been ordered after practical experience of the working of a similar meter which forms part of the "Thomas" total heat meter installed at the Orgreave plant about three years ago.

D.O.T. Appointments

The Department of Overseas Trade announces that there are now two posts of Deputy Comptroller-General in the Department. One of these has been held by Mr. E. R. Eddison, C.B., C.M.G., since April 1st, 1930. To the second post the

Secretary of State for Foreign Affairs and the President of the Board of Trade have appointed Mr. Arthur Mullins, C.M.G., C.B.E., formerly a director of the Department and Commissioner of the Overseas Trade Development Council.

Prices of Materials

Messrs. Henry Gardner & Co., Ltd., report December 11th: No change in the price of copper bars (best selected), sheet and rod. English pig lead, £19 5s., 10s. dec. Spelter, £15 8s. 9d., 5s. dec. English block tin, £219 10s., £3 10s. dec.

Messrs. Frederick Smith & Co., Ltd., report December 11th: No change in the price of electrolytic copper bars, wire rods and h.c. wire and silicium bronze wire.

Messrs. Edward Till & Co. report December 11th: No change in the price of India rubber, Para fine.

Refrigeration Plant and a Change-over

The contention that a change-over from d.c. to a.c. had a damaging effect upon a refrigerating plant that had been satisfactory since 1930 was the basis of a three days' action just concluded in the Isle of Man High Court. The plaintiff, Mr. W. Tinker, a Douglas butcher, sued the Corporation for £160 15s., the cost of installing a new refrigerating plant and repairs to the old one. Evidence for the respondents was to the effect that a suitable rectifier had been installed but plaintiff claimed that with this in use the necessary degree of coldness could not be obtained and that his hotel supply contracts suffered. The verdict was in favour of the Corporation, but an adjournment was allowed "to consider the position."

New E.C.A. Members

At a recent meeting of the Council of the Electrical Contractors' Association a number of applications for membership were considered, and the following contractors were admitted to full membership:—

W. Canning (W. T. Canning & Co., Ltd.), 47, Goldhawk Road, London, W.12.
T. A. Keating (Keating & Miskin), 186 and 154, Westcombe Hill, Backheath, London, S.E.3.
M. R. Batt-Partington (Partington), Brighton.
E. T. Mayer (Mayer & Co. (1932), Ltd.), Barry.
A. G. Trenchard, Barry.
A. J. Rowberry (W. Rowberry & Son, Ltd.), Hereford.
J. Johnston, Belfast.
S. Smith (Cheadle Elec. & Radio Co., Ltd.), Cheadle, Staffs.
H. E. Hawley, Stoke-on-Trent.
J. Whiteley (Broughton and Irlam Electrical Engineering Co.), Salford.
G. B. Carnegie (G. B. Carnegie & Co.), Newcastle-on-Tyne.
H. E. Fletcher, Oldham.
T. Winterbottom (Marchbank & Winterbottom), Royton.
T. V. Twist (T. Twist & Sons), Earlestown, Lancs.

The following contractors were admitted to associate membership:—

W. E. Sparrow (Sparrow & Co.), Gloucester.
F. J. Wood (Fred. Wood & Son), King's Heath, Birmingham, 14.
E. C. Johnson (Edstan Electric), Hanley, Staffs.
D. V. Priest, Halesowen.
C. C. Ridout (C. & F. Ridout), Bearwood.
T. A. Civil, Hexham.
R. Turton (Electrical Supplies Co.), Chesterfield.

Trade Announcements

Mr. S. A. Harrowell, 3, Fitzroy Street, London, W.1, has been appointed the sole selling agent for London, for the products of Messrs. A. G. Hackney & Co., Fairfield Pottery, Hanley.

Messrs. Hogan & Wardrop, Ltd., have been appointed sole selling agents by Messrs. Samuel Simister & Co., Bolton, manufacturers of "Washwell" electric wash boilers, for London, Notts, Derby, Midlands, South Wales, South and East Coasts and export from these territories. They are carrying stocks in London.

During the renovation of their Staple Inn premises Messrs. Lionel Robinson & Co., Ltd., are taking temporary offices at Furnival House, 14-18, High Holborn, W.C., as from December 28th.

Cooker Switch Film

Included in the British Gaumont "Film Magazine" now on exhibition at various cinemas is a short film made at the Hanger Lane factory of Arrow Electric Switches, Ltd., dealing with the manufacture, assembly and installation of three-heat rotary cooker switches.

Modern Domestic Design

The December number of the *Architectural Review* (5s.) is devoted entirely to the equipment of the home. A large section contains excellent photographic reproductions of furniture, fabrics, kitchen appliances, lighting and heating equipment, &c., with brief details and prices. The modern trend of design is exemplified in a telling manner.

New Catalogues and Lists

Brown Bros., Ltd., Great Eastern Street, London, E.C.2.—A list of Christmas gift suggestions.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—An illustrated publication on wood refuse collecting.

Higgs Motors, Ltd., Witton, Birmingham, 6.—Catalogue sections dealing with industrial electric motors, totally enclosed induction motors, crane and hoist motors, repulsion start induction motors, undergeared machines, gear units and polishing and grinding motors.

Ferranti, Ltd., Hollinwood.—A leaflet describing 2½-in. dial instruments and an instruction leaflet on an a.c./d.c. circuit tester.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, Oxford Street, London, W.1.—Leaflets on the new glass toaster and Christmas gift suggestions.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Pamphlets on oil-break switches, plugs, fuses, immersion heaters, sterilising cabinets, electrode water heaters, kiosk sub-stations, and "Reylovolt" transformers. There is also a booklet in the form of a technical treatise upon safety in consumers' l.v. installations, by H. Leyburn.

Copper Development Association, Thames House, Millbank, London, S.W.1.—The latest booklet to be issued deals with bearing bronzes.

Crossley Bros., Ltd., Openshaw, Manchester, 11.—"Power," a booklet setting forth the advantages of the oil-engine for driving generating sets.

Julius Sax & Co., Ltd., 27, Lower Mall, Hammersmith, London, W.6.—A complete 60-page catalogue of electric bells, indicators and electric lighting accessories.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—A folder illustrating the latest range of lighting fittings.

Switchgear & Equipment, Ltd., Delavox Works, Banbury.—A leaflet on oil-immersed self-reclosing circuit-breakers.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.—A list of electric motors, transformers, cables, &c., new and second-hand.

Hoffmann Mfg. Co., Ltd., Chelmsford.—A 103-page catalogue, with a thumb index, of ball and roller bearings.

Rawlplug Co., Ltd., Cromwell Road, London, S.W.7.—A showcard in four colours dealing with plastic wood.

Johnson Engineering Co., Ltd., 85, Great Portland Street, London, W.1.—A leaflet describing a new sewing machine light.

Knightshades, Ltd., 36, Queensway, Ponders End.—Particulars of the new "Wall-lite" lamp.

Edwardes Bros., 20, Blackfriars Road, London, S.E.1.—A 36-page catalogue of electrical fittings and appliances.

Bankruptcy Proceedings

S. D. C. Orchard (trading as Empire Radio), 43, Malmesbury Road, Shirley, Southampton, lately carrying on business as an electrical engineer.—The public examination herein was resumed at the Court House, Castle Square, Southampton, recently. It was estimated that the deficiency was £1,457. Debtor attributed his failure to contracting bad debts of between £200 and £300, and illness. The examination was adjourned.

F. Cox, 16, Crown Street, Newark-on-Trent, lately 97, Balderton Gate, Newark-on-Trent, electrical engineer.—The first meeting of creditors herein was held at the Official Receiver's Office, 22, Regent Street, Park Row, Nottingham, when a statement of affairs submitted showed a deficiency of £127. Debtor attributed his failure to insufficient electrical work, loss on sales of radio receivers through allowing customers free service, and illness in his family. The matter was left in the hands of the Official Receiver.

S. W. Godfrey, 44, Cromwell Road, Sprowston, Norfolk, formerly carrying on business at 141, Mansfield Road and 239, Alfred Street Central, both Nottingham, electrical and radio engineer.—The above debtor appeared for his public examination on December 5th at the County Court House, St. Peter's Gate, Nottingham. The statement of affairs disclosed a deficiency of £676 and debtor attributed his position to lack of capital, overbuying on credit terms, excessive allowances to customers on sets taken in part exchange, and to other causes. The examination was closed.

L. Marson, electrical contractor, 81, Norwood Road, Herne Hill, S.E.—Receiving order made November 30th on debtor's own petition. Public examination February 7th at Bankruptcy Buildings, Carey Street, W.C.

N. Ellis (Oxenhope Radio Stores), Station Road, Oxenhope, and 20, New Road, Denholme.—Public examination December 17th at the County Court, Manor Row, Bradford.

W. E. James, radio engineer and wireless merchant, 8, Church Street, Ebbw Vale.—Public examination January 23rd at the Town Hall, Tredegar.

I. Faulkner (Provincial Lighting & Engineering Co.), electrical engineer, 369, Eccles New Road, Weaste, Salford.—Application for discharge to be heard on January 28th at the Court House, Salford.

C. Wiseman, radio dealer, 317 and 322, Walworth Road, Walworth, S.E.—Discharge suspended for six months until May 5th, 1936.

D. C. Luen, wireless dealer, 73, High Street, Barry.—Discharged as from December 5th.

H. H. Baron, electrician, 84, Duckworth Street, Darwen.—First and final dividend of 5¾d. in the £, payable December 11th at 7, Lord Street West, Blackburn.

H. W. King, wireless goods dealer, 124, Hither Green Lane, Lewisham, S.E.—Receiving order made December 2nd on a creditor's petition.

F. S. S. Wates, wireless set manufacturer and salesman, 53, Lancaster Gate, W.2.—Discharge suspended for three months until February 12th, 1936.

Company Liquidations

City Wireless Co., Ltd.—Winding up voluntarily. Liquidator, Mr. P. E. Beaver, 80, Whitechapel, Liverpool. Particulars of claims to the liquidator by January 6th.

W. S. Wilton & Co., Ltd.—Particulars of claims by December 23rd to the liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Wood Fittings & Standards, Ltd.—Particulars of claims by December 31st to the liquidator, Mr. D. Winter, 39, St. James's Street, S.W.

A. Rist (1927), Ltd.—Meeting January 10th at 11, Ironmonger Lane, E.C., to receive an account of the winding-up by the liquidator, Mr. F. W. Charles.

Shalless & Evans, Ltd.—Meeting January 13th at Balfour House, Finsbury Pavement, E.C., to receive an account of the winding-up by the liquidator, Mr. W. A. J. Osborne.

Electricity Supply

Lighting, Domestic, Power

Aberdeen.—CABLE-LAYING PROGRESS.—In reply to a question at a recent meeting of the Town Council the convener of the Electricity Committee (Coun. Graham) stated that the Department had spent £200,000 on cables during the past five years, laying 163 miles, and that since its inception the Department had laid 448 miles of cable as compared with the 221 miles of piping laid by the Gas Department. The Electricity Commissioners have sanctioned a loan of £100,000 for further cable extensions.

Aylesbury.—MANY NEW CONSUMERS.—Owing to the Central Electricity Board taking over the whole supply of electricity to the undertaking as from the commencement of 1934 most of the generating plant was dismantled and sold, states Mr. W. A. Turnbull, the borough electrical engineer, in his annual report for the year ended March 31st, 1935. At the end of March last the number of consumers was 3,523 in Aylesbury and 8,009 in the rural area, consumers connected during the year numbering 1,233. The length of the high-voltage transmission lines was increased from 157 to 171 miles, and the low-voltage distribution from 138 to 148 miles. The following new districts have been switched in during the course of the year: Boarstall, Emmington, Kingsey, Kingswood, Meadle, and Owlswick. The hired apparatus connected to the system numbered 8,974, of which irons (2,879), kettles (2,730) and cookers (1,805) were the chief items. Financial statistics relating to the undertaking were given in last week's issue of the ELECTRICAL REVIEW.

Barnstaple.—INQUIRY.—Mr. H. Nimmo is to hold an inquiry on December 19th into the application of the Town Council for permission to install at the generating station two 450-kW diesel engine-driven generating sets, with ancillary plant.

Barrhead.—CHEAPER STREET LIGHTING.—The Strathclyde Electricity Supply Co., Ltd., has reduced the charge for electricity for all-night street lighting from 1½d. to ¾d. per kWh.

Barrow-in-Furness.—BULK-SUPPLY AGREEMENT.—The Cark and District Electricity Co., Ltd., has intimated to the Electricity Committee that it is now prepared to enter into a five-years' agreement with regard to the bulk supply to Cark on similar terms to those offered to Ulverston and Grange, and that it is proposed that the agreement should take effect as from October 1st last.

OVERHEAD LINES.—The consent of the Ministry of Transport has been obtained to the erection of 11-kV overhead lines between Blawith, Coniston, Hawkshead and Broughton Moor Slate Quarries.

ELECTRIFIED MILLS.—Negotiations with regard to the electrification of their corn mills have been concluded with Messrs. Walmsley & Smith. A revenue of £1,000 a year is guaranteed.

UNDERGROUND CABLE.—The Electricity Committee has decided, in view of breakdowns on the overhead line to Rampside, to lay an underground cable at a cost of £2,047.

LOANS.—Sanction has been obtained to a loan of £5,000 for meters, and permission is being sought to borrow a further £20,000 for apparatus.

Billingham-on-Tees.—CONVERSION TO ELECTRIC STREET LIGHTING.—The Urban District Council is applying to the Ministry of Health for sanction to borrow £15,272 for electrifying the street-lighting system. There will be over a hundred all-night lamps in the area.

Blackburn.—WHITEBIRK STATION'S LARGE OUTPUT.—In a report for the half-year from April 1st to September 30th Mr. R. H. Harral, the borough electrical engineer, states that the Whitebirk power station, which is now operated in conjunction with the Central Electricity Board, generated 11,815,900 kWh (or 86.73 per cent.) more than in the corresponding period of last year. The abnormal increase was due to the very low works cost per kWh and the consequent revision of the Board's programme in order to take the fullest advantage of the economical working of the station.

Bolton.—EXTENSIONS.—In order to carry out extensions in the Tonge Moor area sanction to a loan of £3,190 has been obtained.

Bridlington.—NEW SCALE OF CHARGES.—The Town Council has adopted the following scale of charges as from February 1st next: Lighting: Up to 1,000 kWh per quarter, 4½d. per kWh; 1,000 to 2,500 kWh per quarter at 4¼d.; beyond at 4d. Outside signs or illuminations, 3¾d. per kWh. Cinema apparatus, 3d. per kWh. Refrigerating plant at 1½d. Heating and power: Up to 250 kWh per quarter, 3d. per kWh; 250 to 500 at 1½d.; beyond at 1d. Domestic tariff, where electricity (or coal and electricity) is used for cooking, for all domestic purposes except lighting, ¾d. per kWh. All charges are subject to a discount of 5 per cent. for prompt payment.

Carlisle.—WIRING RESTRICTIONS WITHDRAWN.—The Finance, and Gas and Electricity Committees have decided to withdraw the restrictions limiting the number of houses wired under the assisted-wiring scheme to 400 per annum.

Castletown (Caithness).—STREET-LIGHTING SCHEME COMPLETED.—Street lighting by electricity was inaugurated recently. The work was carried out by the Thurso and District Electricity Supply Co., Ltd.

Chile.—NATIONALISATION PROPOSAL.—It is announced that Señor Ross, Finance Minister, and Mr. Curtiss E. Calder, president of the South American Power Co., have reached an agreement to nationalise the power industry in Chile. The announcement follows the proceedings brought by the Chilean Government against the American-controlled electrical group with regard to alleged illicit exchange transactions, totalling nearly £2,000,000.—*Reuter.*

Dudley.—STREET LIGHTING.—The accompanying illustration is from an unretouched photograph of the new municipal buildings at Dudley. The street-lighting standards, which, with the lanterns, were made by the Revo Electric Co., Ltd., are 20 ft. high to the spigot and are made of cast iron. Seven

The new municipal buildings at Dudley well illuminated by the Revo street lighting

standards are used, placed 70 ft. apart, and the 500-W lamps are housed in bronze-finished cast-iron lanterns.

SUB-STATION.—The Midland Electric Corporation, Ltd., is to erect a sub-station in Woodland Avenue.

Essex.—SUPPLY TO AN INSTITUTION.—The Public Assistance Committee has accepted the quotation of the County of London Electric Supply Co., Ltd., for a supply to the Billericay Institution.

Fort William.—PROPOSED MUNICIPAL UNDERTAKING.—The Town Council has accepted the Lochaber Power Company's offer to supply electricity in bulk, and is to apply to the Electricity Commissioners for a Special Order empowering it to become an authorised distributor of electricity. In view of water-power developments which are taking place in the area a fifteen-year agreement was decided upon. Plans for the construction of transforming and transmission stations, &c., are to be prepared.

France.—HYDRO-ELECTRIC PLANT.—A hydro-electric plant was opened at La Dixence, near Sion, in Canton Valais, last Saturday. The filling of the artificial lake, at an altitude of 6,600 ft., was begun in November, 1934, and the power plant in the Rhône Valley was completed a few weeks ago. The water from the lake makes a single fall of 5,745 ft., the highest in Europe.—*The Times.*

Friern Barnet.—SUB-STATION.—The North Metropolitan Electric Power Supply Co., Ltd., is to erect a sub-station in Temple Avenue.

Gravesend.—A FRINGE ORDER DISPUTE.—In the Chancery Division on Wednesday the Attorney-General (at the relation of the Kent Electric Power Co.) and that company sought an injunction against the Gravesend Corporation to restrain it from supplying electricity to two companies said to be outside its area. It was stated that a consent to the supply had been issued by the Electricity Commisioners, but had later been revoked. The Corporation denied that it had supplied any energy to the two companies outside its area of supply; it had supplied, and was still supplying, energy in its area of supply but not otherwise. The case was proceeding as we went to press.

Grays Thurrock (Essex).—NEW SUPPLY AREA SUGGESTED.—It is proposed to amalgamate certain areas to form a new Thurrock urban district, and at a recent meeting of the existing Grays Thurrock Council the question of electricity supply in the new district was discussed. It was resolved to make representations with a view to the Council's undertaking being given powers to supply the whole district. The opinion was expressed that this would result in an improved general service and standardisation of tariffs. Copies of the resolution were forwarded to the Tilbury, Purfleet and Orsett Councils for their support. Grays Thurrock and Tilbury are surrounded by the County of London Electric Supply Company's area.

Hull.—MAINS AND SERVICES.—The Electricity Committee has obtained sanction to borrow £75,000 for mains and services and £25,000 for wiring.

Leeds.—ELECTRIC PUMP.—The Water Committee is to install an electric centrifugal pump at Headingley pumping station at a cost of £1,000.

KIRKSTALL POWER STATION.—Sanction has been granted to loans of £15,500 for buildings and £204,000 for plant at the Kirkstall power station.

Lewes.—LOWER FLAT RATE.—As from January 1st the Lewes and District Electric Supply Co., Ltd., is reducing its lighting flat rate from 7½d. to 7d. per kWh.

Liverpool.—CABLE LAYING.—New feeders are to be laid from the Lister Drive power station, Liverpool, to several points along the Prescot Road, West Derby Road and Muirhead Avenue tramway routes. The cost is estimated at £20,000. Traction feeders from the Lavrock sub-station are to be relaid at an estimated cost of £5,600.

BATTERY-CHARGING TARIFFS.—Concessions are to be made in respect of electrical energy required for charging vehicle batteries. In future, the rate will be ¼d. per kWh, but the supply will not be available between 4 p.m. and 6.30 p.m. during November, December, January and February.

London.—POPLAR.—The net surplus on the working of the Electricity Department during 1934-35 was £39,113, an increase of £3,164 compared with the previous year. The total sales (50.8 million kWh) were slightly less, due to several large consumers leaving the district. At March 31st last there were 27,178 consumers, 2,064 new customers having been connected during the year. There were 957 cookers and 198 wash-boilers connected to the mains. Since March, however, the effect of the cooking demonstrations early this year has resulted in the number of cookers connected being increased to over 2,000.

COLLIERS FOR FULHAM'S NEW GENERATING STATION.—The first of the series of colliers ordered by Fulham Borough Council for carrying coal to the new base-load station now approaching completion was launched on Saturday at Burntisland (Fifeshire). The christening ceremony was performed by the Mayoress of Fulham (Mrs. S. Vanderhook), the chairman of the Electricity and Lighting Committee (Ald. C. Lancaster) being among those present. Each collier will be capable of carrying approximately 2,400 tons of coal, and will operate from the various coalfields around Britain, the boats being of a special design to enable them to be suitable for voyaging at sea and also for travelling up the Thames. They will be the largest boats penetrating as far as Fulham, which is fifty-six miles from the mouth of the river.

Loughborough.—IMPROVED STREET LIGHTING.—A scheme for improved street lighting is being considered by the Town Council.

Maidstone.—NEW MAINS.—The Town Council is to extend the mains to supply 259 houses on the Cherry Grounds estate, at a cost of £3,014, and to Willington Street to supply fifty houses (£1,160).

HOP DRYING.—All electricity used for hop drying during the September quarter is to be calculated at the power rate.

Viewed through an arboreal screen, the floodlighted Faversham Parish Church presents an attractive picture. The photograph was sent to us by Mr. G. Sommerville (borough electrical engineer), whose staff installed the equipment, using "Ediswan Mars" projectors

Manchester.—LOANS.—Sanction to borrow £40,000 for buildings and £335,000 for plant at Barton power station has been granted to the Electricity Committee.

Margate.—ILLUMINATED CHRISTMAS TREES.—The principal squares and gardens of Margate, Westgate-on-Sea and Birchington are to have 15-ft. Christmas trees decorated by coloured lamps. The strip lighting on the sea front is also to be brought into use.

Mold (Flintshire).—LOWER CHARGES.—The Urban District Council has reduced the tariff for cooking and heating to 1d. per kWh. All meter rents are abolished.

Newton-in-Makerfield.—DEVELOPMENT PROPOSALS.—We have received from Mr. W. Phœnix, the engineer and manager, details of a scheme which he has prepared (and his Council has approved) to speed up development in the town. In the first place, it is intended to complete the distribution in from two to three years, so that any ratepayer can be given an immediate supply when he requires it. Already 70 per cent. of the houses in the district are wired. Guarantees to cover capital expenditure on mains are not to be the primary consideration. A special business tariff is to be introduced as well as a special rate of ¼d. per kWh for electric vehicle battery charging, and the charges for the hire of cookers, water-heaters, wash-boilers, &c., are to be substantially reduced. There are to be additions to the staff, including a distribution assistant and a lady showroom assistant, and a reorganisation of the internal administration. A definite amount of 2½ per cent. of the revenue from general consumers and appliances, &c., is to be devoted to propaganda. Mr. Phœnix says that although in his town both electricity and gas undertakings are under the Council's control both are given a free hand, and the ratepayer has a free choice.

Norham and Islandshires.—ELECTRICITY PLANS.—Details of proposed electrical development in the area have been placed before the Rural District Council by the Scottish Southern Electric Supply Co., Ltd.

Nottingham.—LARGE LOAN FOR EXTENSIONS.—Mains extension schemes on a large scale are foreshadowed by a decision of the Electricity Committee to seek sanction to a loan of £250,000.

Oswestry.—RURAL DISTRIBUTION.—The Town Council has decided to complete its rural extension scheme at a cost of about £1,050.

Reigate.—REVISED TARIFF.—The Town Council has revised the business two-part tariff, adopting a tariff based on a charge of £10 per kW on the maximum demand, plus a "unit" charge of ¾d.

Scotland.—HYDRO-ELECTRIC PROPOSAL.—A plan to make use of the water-power resources of Inverness-shire has been lodged with the Sheriff Clerk at Fort William. According to the draft Provisional Order it is proposed to incorporate a company, to be known as the Caledonian Power Co., for the purpose of generating and supplying electricity, mainly to the British Oxygen Co., Ltd. The project involves the construction of four power houses, which will be situated at Loch Hourn, on the Sound of Sleat; at Ceannacroe, near Invermoriston; at Invergarry, on the Oich; and at Invermoriston. The power will be conveyed by means of high-voltage transmission lines to the village of Corpach, three miles from Fort William, where it is proposed to build a factory. The scheme, which is to cost about two million pounds, will involve the building of dams, aqueducts and tunnels, and road reconstruction. The waters of Loch Quoich, Loch Garry, Loch Cluanie and the Moriston River are to be utilised.

Sheffield.—MAINS.—Extensions to mains at a cost of £8,952 have been approved by the Electricity Committee.

SITE FOR ENLARGING NEEPSEND POWER STATION.—For extensions to the Neepsend power station the Electricity Committee has acquired a site in Club Mill Lane.

Sleaford.—TARIFF FOR WASH-BOILERS.—The Electricity Committee has decided that consumers using electric wash-boilers shall be charged at the domestic tariff of ¾d. per kWh, plus the usual fixed charge.

Stratford-on-Avon.—OVERHEAD LINES.—The Rural District Council has consented to the Leicestershire and Warwickshire Electric Power Co., Ltd., extending its overhead lines at Ullenhall.

Stretford.—TRANSFORMER TESTING.—The Metropolitan-Vickers Electrical Co., Ltd., is to erect a high-power test transformer house at Westinghouse Road.

Stourbridge.—NEW SUB-STATION AT LYE.—A short time ago, as recorded in the ELECTRICAL REVIEW of November 8th, a new sub-station of the Midland Electric Corporation for Power Distribution, Ltd., was opened at the Hayes, Lye. It was built to form part of the new 33,000-V ring main system to relieve the load on the existing 7,000-V mains and to provide an adequate supply to meet the growing load in the district. B.I. cables and Ferguson Pailin switchgear were used.

Swadlincote (Staffs).—ELECTRICITY REFUSED.—Tenants of Council houses have been refused permission to have electricity installed.

Swale (Kent).—COMPANY PROMISES EXTENSIONS.—In reply to the Swale Rural District Council's request that electricity supplies should be made available in various localities the Kent Electric Power Co. has stated that extensions to several of the parishes concerned, costing altogether £5,000, will be included in the programme of work which is to be undertaken next year.

Tonbridge.—The Urban District Council has adopted a scheme for the maintenance of wiring installations in consumers' premises, the charges to be as follows: Houses up to £12 rateable value, lighting installation, 4s. per annum; power and heat, 6d. per point per annum; houses above £12 rateable value, lighting, 6d. per point per annum; power and heat, 6d. per point per annum; minimum annual charge, 5s.

Turkey.—ELECTRICITY OUTPUT.—According to the recently issued report of the Société Turque d'Electricité, Istanbul, the output of the central power stations of the company during 1934 amounted to 98.8 million kWh, as compared with 92 million kWh in the preceding year. The number of consumers increased from 85,938 to 92,455. Further improvement has taken place this year, the production during the nine months ended September last amounting to 74.4 million kWh, which is 4.2 million kWh more than during the same period of 1934.

Uxbridge.—COUNCIL HOUSE SUPPLIES.—A report is to be presented to the Council showing the estimated cost of installing electricity on those of the Council's estates not already provided with such facilities.

Wallsend.—NEW CABLE EXTENSIONS.—The Town Council has approved plans submitted by the North-Eastern Electric Supply Co., Ltd., for laying a cable in Churchill Street, Wallsend, to supply houses being erected for the Battle Hill Estate Co., Ltd.

Walsall.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £1,600 to supply premises at Barr Beacon.

West Bromwich.—LOANS.—The Town Council has approved a recommendation of the Electricity Committee to apply for sanction to borrow £30,000 for mains and £4,000 for the equipment of consumers' sub-stations.

Worcester.—ELECTRIC KITCHENS.—It is proposed to develop the City Council's new Martley Road housing site by building sixty-two dwellings of an improved type to rehouse tenants displaced by clearance schemes. Consideration is being given to a recommendation that the kitchens should be electrically equipped.

Worthing.—SUB-STATION AND RADIO INTERFERENCE.—With regard to radio interference from Heene Place sub-station representations have been made to the English Electric Co., Ltd., which supplied the sub-station equipment, and while the company is under no legal obligation, it is prepared to share equally with the Corporation the cost of the apparatus necessary to prevent the interference, estimated at £150. The Electricity Committee has accepted this offer.

Wolverhampton.—MAINS EXTENSIONS.—Mains are to be extended at a cost of £826 to supply a new estate at Penn.

Traction

Bradford.—TROLLEY-BUS ROUTE EXTENSION.—The Duckworth Lane trolley-bus route to the new Royal Infirmary is to be extended at a cost of £1,000.

Brighton.—DEMONSTRATION TO CONVINCE RATEPAYERS.—We understand from the *Daily Telegraph* that in an endeavour to win the favour of local ratepayers who are opposing its scheme for the substitution of trolley-buses for trams, the Corporation put a free demonstration service into operation on a circular route around the Level on one day this week.

Italy.—HEAVY ELECTRIC LOCOMOTIVES.—The Italian State Railways are putting into service on their 3,000 V d.c. lines between Florence, Rome, and Naples, and from Naples to Foggia, a number of 5,640 h.p. electric locomotives for heavy goods trains. These units have twelve 470 h.p. motors which can give a tractive effort of 70,000 lb. at 25 m.p.h. for one hour, and 37,500 lb. at 55 m.p.h. The top speed is 58 m.p.h., the length 95 ft., and the weight 180 tons.

Germany.—ROLLING STOCK CONSTRUCTION PRACTICE.—Recently electric locomotives of the German State Railways have been built up on steel frames of entirely welded construction, and on the latest 4,000 h.p. locomotives the weight saved is three tons, corresponding to 20 per cent. of the old frame weight. A number of electric motor coaches used on the Berlin urban and suburban railways have the bodies, underframes and bogies constructed of aluminium alloys with a saving in weight of 30 per cent. compared with the old cars.

Japan.—OSAKA "UNDERGROUND" COMPLETED.—Our Yokohama correspondent reports that the Osaka underground railway, which runs in a southerly direction from Umeda to Namba, has been completed.

Norway.—INTRODUCTION OF TROLLEY-BUSES URGED.—At present there are no trolley-bus services in Norway, the transport authorities having restricted operation to tramcars and buses. Our Scandinavian correspondent reports, however, that the question of providing trolley-buses was discussed at a recent meeting of the Norwegian Electro-technical Society, when Professor Jacobsen spoke in their favour.

South Africa.—ELECTRIC TRAIN PERFORMANCE.—The 1,500 V d.c. trains on the Capetown suburban services, with 225 h.p. motors taking 225 A at 750 V, consume 86 Wh per ton-mile (measured on the train) when making eleven stops in eight miles. Every 100,000 to 150,000 miles the armatures are rebanded, dipped and baked, and the pantograph wearing strips (of cadmium-copper) are renewed every 25,000 miles. The brush wear is at the rate of 1¼ in. and the commutator wear 0.006 in. per 100,000 miles. At the pitch circle, the motor gear-wheel teeth wear 0.005 in. and the pinion teeth 0.015 in. per 100,000 miles.

South Shields.—TRACK RENEWAL.—Sanction has been received by the Town Council to a loan of £4,000 for the renewal of the tram track in Fowler Street, and £4,737 for similar work in Westoe Road.

Sweden.—ELECTRIC LOCOMOTIVES.—On the Boras railway, which is being converted to operation by electricity, a departure has been made from the usual system on the State railways; in place of two motors with coupling rods to the driving wheels single driving has been adopted for each axle, there being four motors in all. The State railways are also dispensing with coupling rods in the case of small locomotives for certain lines.

ELECTRIFICATION OF RAILWAYS.—A new electrified section on the State Railway line was inaugurated last week between Krylbo and Bollnäs (156 km.) on the northern main line, states *Reuter's Trade Service* (Stockholm). The remaining unelectrified section to Aange, which will for the present be the terminus of the electrified part of the main line, is 167 km. long, and much of the work on this line is already completed. In south Sweden electrification of the Hässleholm to Markaryd and Veinge line, a distance of 72 km., is almost completed, and it will probably be opened for electric traffic on December 15th.

Communications

Great Britain.—LIGHTHOUSE RADIO.—Direct wireless telephony has been inaugurated between the coastguard station at Fife Ness (Firth of Forth) and the lighthouses at Bell Rock, Inchcape and Bass Rock.

Finland.—HIGH-POWER BROADCASTING.—Our Scandinavian correspondent states that, according to a message from Helsingfors, the new high-power station near Lahti is now finished and test transmissions on 220 kW were commenced on December 6th.

Japan.—LONG DISTANCE BROADCASTING.—Radio programmes are to be sent from Tokyo to India, Siberia and South America. This follows successful broadcasts during the last four months to Canada, the United States and Hawaii. The services to India and Siberia are to begin next March, and that to South America this month. The Foreign Office is considering, in this connection, the establishment of a new department for overseas broadcasts to supply official news.—*Reuter*.

Norway.—SUPPRESSING INTERFERENCE.—In April last laws were passed to restrict interference with radio reception, and since then 4,100 sources of interference have been investigated and 2,685 motors and other electrical apparatus have been modified to eliminate disturbance.

NEW RADIO STATION.—Our Scandinavian correspondent reports that work has been commenced on the new Norwegian broadcasting station at Akya, near Bergen. The new transmitter will cost about £30,000, and will have an aerial output of 20 kW. The contract has been placed with a German firm.

A NEW OSLO-VADSO LINK.—Under this heading there appeared in our issue of October 25th an item regarding a h.f. cable 2,200 km. in length. We are now informed that the details given do not coincide completely with the actual facts. The line in question is not a cable, but consists of two open wire circuits, which have a frequency range of from 0 to 42,500 cycles. Cables having a total length of 30 km. are inserted in the open line only for the purpose of bridging the fjords. These cables have to meet special requirements; to ensure perfect transmission they are provided with loading coils at 240 m. spacing, and are partly laid at depths of several hundreds of metres. Standard Telephones & Cables, Ltd., London, supplied the equipment for six carrier telephone channels, while the cables as well as the equipment of the two telegraph channels and of the carrier broadcast channel were supplied by Siemens & Halske, Berlin.

South Africa.—TELEPHONE SCHEMES.—Details of schemes for improving the telephone facilities of the Union are given in the *British and South African Export Gazette*. The Johannesburg central exchange, the largest in the country, will be converted to automatic working next month, and it is hoped that by the end of 1939 automatic apparatus will be installed at all the centres from Springs to Randfontein. The contracts have now been placed for a £32,000 post office at Springs, and when the structure is finished the erection of automatic equipment for 10,000 subscribers will be proceeded with. It is anticipated that the Durban exchange will be converted on February 1st next, the total cost being estimated at £105,000. A five-digit system will replace the four-digit equipment at the two suburban exchanges at Stamford Hill and Toll Gate. An air-cooling and humidifying plant will be installed at the central exchange.

Sweden.—AIRCRAFT RADIO DEVELOPMENT.—The Air Ministry has granted nearly £20,000 for the expansion of the wireless service, including acquisition of modern wireless piloting equipment at the Gothenburg, Malmö and Stockholm airports.

Cotton Tapes and Webbing

A Standard Specification, based on an E.R.A. report, for the purchase of cotton tapes and webbings for electrical purposes with methods of test for the insulation of coils has been issued. As it is the first specification of its kind, the requirements have been limited to the more essential properties necessary. It applies to four classes of tape, ranging from fine insulating tape to heavy webbing. Standard widths, thicknesses, and sizes of rolls are specified, and tests are stipulated for tensile strength and conductivity of the aqueous extract obtained by boiling strips of the tape in water. Appendices deal with the methods of measurement and test. Copies of this specification (No. 633-1935) can be obtained on application to the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdeen.—December 14th. County Education Committee. Central heating and electric lighting of premises to be used as junior instruction centre. E. L. Williamson, architect, 154, Union Street.

Town Council. Various works, including electrical and heating, at new primary school, Seaton Place. J. A. O. Allan, 25, Union Terrace.

Abertillery.—January 9th. Electricity Department. Plant and equipment for change-over from d.c. to a.c. (December 6th.)

Argentina.—BUENOS AIRES.—December 26th. State Oilfields Directorate. Thirteen transformers and circuit-breakers and switches, &c. (T.Y. 10252.)* Fifty-one induction motors with control gear, switches, &c. (T.Y. 10251.)*

Australia.—BRISBANE.—January 17th. City Council. One 500-kW turbo-alternator. (T.Y. 10247.)*

MELBOURNE.—January 29th. City Council. Totally enclosed metal-clad switchgear for the Spencer Road power station. (T.Y. 10257.)*

Barking.—December 16th. Essex C.C. Education Committee. Electrical installation at South-East Essex Technical College. (November 29th.)

Beckenham.—December 30th. Borough Council. Two transformers. (See this issue.)

Beeston and Stapleford.—December 23rd. U.D.C. Electrically operated vertical spindle centrifugal pumps for new pumping station at Beeston. W. H. Radford & Son, consulting engineers, Albion Chambers, King Street, Nottingham (deposit £5 5s.).

Bexley.—January 20th. Electricity Department. Cable with jointing, transformer and switchboard. (See this issue.)

Bridgend.—January 3rd. Electricity Committee. Materials and labour in connection with underground and overhead mains extensions. (December 6th.)

Cheadle & Gatley.—December 13th. Electricity Department. One 350-kVA transformer with manually operated on-load tap changer. (November 29th.)

Coventry.—January 25th. Electricity Department. One 30,000-kW turbo-alternator and two water-tube boilers. (See this issue.)

Eastbourne.—January 7th. Electricity Department. Materials for twelve months. (See this issue.)

Edinburgh.—December 14th. Corporation. Four electric hydro-extractors at the public washhouse, South Gray's Close. City architect.

Egypt.—KHARTOUM.—December 29th. Ministry of Public Works. Fifty-six a.c. ceiling-type electric fans with speed regulators. (T.Y. 10238.)*

CAIRO.—January 28th. Ministry of the Interior. Two transformer kiosks, each containing a 70-kVA transformer and 3,150-V and 220-V cable. (T.Y. 10249.)*

Heston and Isleworth.—December 13th. Electricity Department. Street-lighting equipment. (November 29th.)

Hornsey.—December 16th. Electricity Department. Meters, demand indicators, time switches and load controllers. (December 6th.)

Hull.—December 13th. City Council. Electrical installation at the junior and senior departments of the Endike Lane West school. D. Harvey, city architect, Guildhall (deposit £1 1s.).

India.—December 20th. Bombay, Baroda and Central India Railway Co. Boxes, plates, separators, &c., for train-lighting accumulators. (December 6th.)

NEW DELHI.—January 2nd. Stores Department. Five overhead electric travelling cranes with spare parts. (T.Y. 5529.)*

January 16th. One 30-ton electric crane for the locomotive workshops, Moghalpura. Director-General, India Store Department, Belvedere Road, S.E.1 (deposit 10s., not returnable).

Irish Free State.—DUBLIN.—December 31st. Electricity Supply Board. P.i. cables, 40-kV underground power cables and jointing accessories. (November 22nd.)

Kettering.—December 30th. Electricity Department. Cable. (See this issue.)

London.—ISLINGTON.—January 15th. Borough Council. Electrical materials for one year from April 1st, 1936. (December 6th.)

METROPOLITAN WATER BOARD.—January 3rd. Portable electric generator units and centrifugal pumping plant at the Hampton pumping station. Chief engineer, Room 235, 173, Rosebery Avenue, E.C.1 (deposit £2 2s.).

CENTRAL ELECTRICITY BOARD.—January 27th. 132,000-V overhead transmission lines for the Central England Electricity Scheme, 1928. (See this issue.)

Manchester.—December 30th. Electricity Committee. Two water-tube boilers. (November 29th.)

New Zealand.—WELLINGTON.—January 14th. Post and Telegraph Department. Twenty-five secondary cells. (T.Y. 10226.)* 24,600 switchboard cords. (T.Y. 10231.)*

January 21st. 3,000 metal-cased condensers. (T.Y. 10234.)*

Portsmouth.—Electricity Department. One 30,000-kW turbo-alternator and two water-tube boilers. (December 6th.)

Rhyl.—December 31st. Electricity Department. L.p. cable. (See this issue.)

St. Helens.—December 30th. Electricity Department. Feeder pillars and underground disconnecting boxes. (See this issue.)

Scunthorpe and Frodingham.—December 23rd. U.D.C. Electrically driven pumping plant for two pumping stations. (December 6th.)

January 6th. Electricity Department. One sheet-steel kiosk and a 200-kVA transformer. (See this issue.)

Sheffield.—December 30th. Electricity Department. Four water-tube boilers. (November 29th.)

December 14th. Electric lighting installation in three departments at Arbourthorne school and caretaker's house. W. G. Davies, city architect, Town Hall.

South Africa.—PRETORIA.—January 3rd. City Council. 1,000 metal-clad switch and fuse boxes and plugs and sockets. (T.Y. 10254.)*

Southend-on-Sea.—January 9th. Electricity Department. H.p. underground cables. (See this issue.)

Spalding.—Electricity Department. Cable and copper conductors. (See this issue.)

Swindon.—January 10th. Electricity Department. Underground h.p. cables and sub-station equipment. (See this issue.)

Uruguay.—MONTEVIDEO.—February 7th. State Electricity Supply and Telephone Administration. Underground armoured cable. (T.Y. 10259.)*

February 10th. Static transformers. (T.Y. 10260.)*

Wednesbury.—December 31st. Borough Council. Electric wiring and fittings, &c., in houses, shops and maisonnettes to be erected on the Dangerfield Lane, Crankhall Lane (West), Bilston Road (South) and Short Street (Clearance) sites. A. Booth, borough engineer, Town Hall (deposit £1 1s.).

West Riding.—December 30th. County Council. L.p. hot-water apparatus and electric lighting for the extensions of Upton Council school. Education officer, County Hall, Wakefield.

Worthing.—December 14th. Electricity Department. Transformer kiosk sub-station. (December 6th.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 36, Old Queen Street, London, S.W.1.

Contracts Closed

Barrow-in-Furness.—Electricity Committee. Accepted. 600-kVA transformer (£250).—British Electric Transformer Co., Ltd.

Birkenhead.—Electricity Committee. Accepted. Switchgear (£170).—A. Reyrolle & Co., Ltd. Wiring under the assisted scheme: Thirty houses (£131).—S. George; 124 houses (£508).—Park Electrical Co.

Libraries Committee. Accepted. Electric lighting at Upton Library (£169).—J. McKenzie.

Brighton.—Waterworks Committee. Accepted. Switchgear at Balsdean pumping station (£1,126).—Harland Engineering Co., Ltd. Electric lighting at Falmer works (£156).—E. E. Fellingham. Electric lighting at Mile Oak pumping station (£219).—Hall & Stinson, Ltd.

Electricity Committee. Accepted. Maintenance of sea front neon illuminations (£442 per annum).—Ionlite, Ltd. Steam generating units for pulverised fuel firing with electrostatic grit collectors (£140,000).—Babcock & Wilcox, Ltd. Modification of h.p. circuit-breakers to give increased rupturing capacity (£4,737).—A. Reyrolle & Co., Ltd.

Carlisle.—Electricity Committee. Accepted. Supplies for twelve months. Transformers.—Yorkshire Electric Transformer Co., Ltd. Meters.—Metropolitan-Vickers Electrical Co., Ltd.

Leeds.—Electricity Committee. Accepted. Cookers.—Falk, Stadelmann & Co., Ltd. Cables.—Edison Swan Cables, Ltd. (£1,507); Macintosh Cable Co., Ltd. (£1,205); W. T. Henley's Telegraph Works Co., Ltd. (£197); Enfield Cable Works Ltd. (£158).

Liverpool.—Electric Power and Lighting Committee. Recommended. Six 1,000-kVA transformers (£340 each).—Metropolitan-Vickers Electrical Co., Ltd.

London.—L.C.C. Wiring and fittings for electric lighting, &c.:

Blocks 3A and 4 of dwellings in the Perring Street area:

	£
J. H. Plant, Ltd. (Accepted)	**525**
G.E.T. Installation Co.	646
Ryland's Electrical Co., Ltd.	684
City Electrical Co.	708
Buchanan & Curwen, Ltd.	765
G. V. Taylor & Co.	768
H. J. Cash & Co., Ltd.	795
G. E. Gray, Ltd.	1,113

Blocks 1 to 6 of dwellings on the Loraine Place site, Islington:

	£
Henfrey Electrical Installations (Accepted)	**3,661**
Holliday, Hall & Stinson, Ltd.	3,749
Jacob, White & Co., Ltd.	3,996
Barlow Bros. & Co.	4,086
Buchanan & Curwen, Ltd.	4,097
Electrical Installations, Ltd.	4,286
A. Meckhonik.	4,292
Coleby & Co., Ltd.	4,396
Pinching & Walton	4,455
G. E. Taylor & Co.	4,507
Ryland's Electrical Co., Ltd.	4,754
City Electrical Co.	5,038
Harland & Wolff, Ltd.	5,888

380 houses and flats on the Park Lane site, Charlton: £

A. Meckhonik (Accepted)	**3,437**
G. E. Taylor & Co.	3,548
Electrical Installations, Ltd.	3,596
Ryland's Electrical Co., Ltd.	3,833
South Metropolitan Electric Light & Power Co.	4,014
Jacob, White & Co., Ltd.	4,188
Read & Partners, Ltd.	4,299
Francis Polden & Co., Ltd.	5,565
Harland & Wolff, Ltd.	5,592
Pinching & Walton	5,606
Twentyman & Willmott, Ltd.	5,631

13, 15 and 17, Cedars Road, Clapham: £

Twentyman & Wilimott, Ltd. (Accepted)	**670**
Holliday, Hall & Stinson, Ltd.	801
J. H. Plant, Ltd.	880
Basinghall Electric Co., Ltd.	926
Berkeley Electrical Engineering Co., Ltd.	985
T. Clarke & Co., Ltd.	997
Rhymos, Ltd.	1,013
F. Angell & Co., Ltd.	1,084
A. Cozens	1,192

Accepted. Automatic telephone system and provision of cores for installation of electric fire alarm system at the Ladywell Institution (£1,249).—G. E. Taylor & Co.

Wiring and fittings for electric lighting in fourteen houses in Watling Street, Hendon (£268).—Henfrey Electrical Installations. This was the lowest of nine tenders, the highest being £554.

SOUTHWARK.—Highways Committee. Recommended. Traffic signals at six road junctions (£3,660).—Automatic Electric Co. Electricity Committee. Recommended. Cables for twelve months: Derby Cables, Ltd. (£1,751); Connollys (Blackley), Ltd. (£545); Hackbridge Cable Co., Ltd. (£600); Telegraph Construction & Maintenance Co., Ltd. (£290). Feeder pillars (£43 10s. each).—W. Lucy & Co., Ltd.

FULHAM.—Electricity and Lighting Committee. Recommended. Turbo-alternator (£144,694) and main and auxiliary transformers (£19,618).—Metropolitan-Vickers Electrical Co., Ltd. Two sulphur extraction plants (£33,225).—J. Howden & Co., Ltd. Two boilers, etc. £154,760).—Stirling Boiler Co., Ltd.

South Africa.—Railways and Harbours Administration. Accepted. Fourteen electric portal luffing jib cranes for Port Elizabeth harbour and twelve for Table Bay docks.—Babcock & Wilcox, Ltd.

Wiltshire.—Public Assistance Committee. Accepted. Electric lighting at Salisbury Institution (£414).—Rogers & Kirkby.

Wolverhampton.—Electricity Committee. Accepted. Switch cubicle (£130), 500-kVA transformer (£155), and two 200-kVA transformers (£90 each).—British Electric Transformer Co., Ltd. Switch units (£320).—Crompton Parkinson, Ltd.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, December 19th. Institution, London. 6 p.m. "A Cathode-Ray Oscillograph with High-Speed Drum Camera Rotating in Vacuo." Mr. G. A. Whipple.

Tees-Side Sub-Centre.—Friday, December 13th. Linthorpe Assembly Rooms, Middlesbrough. Annual dance. Monday, December 16th. Cleveland Technical Institute, Middlesbrough. 6.45 p.m. "The Stability Characteristics of Alternators and of Large Interconnected Systems." Mr. W. D. Horsley.

North-Western Centre.—Tuesday, December 17th. Engineers' Club, Manchester. 7.15 p.m. "Standardisation of Impulse Voltage Testing." Messrs. T. E. Allibone and F. R. Perry.

Irish Centre.—Thursday, December 19th. Trinity College, Dublin. 6 p.m. "Equipment and Performance of Steel-Tank Rectifier Traction Sub-Stations Operating on the London Underground Railways." Mr. A. L. Lunn.

Birmingham Electric Club.—Friday, December 13th. Grand Hotel, Birmingham. 7.p.m. Annual general meeting.

Junior Institution of Engineers.—Friday, December 13th. Royal Society of Arts, W.C. 7.30 p.m. Presidential address. "Coal, Power and Smoke." Sir F. E. Smith. Friday, December 20th. Institution, London. 7.30 p.m. Informal meeting. Film: "The Manufacture and Uses of Hewittic Rectifiers by the Hackbridge Electric Construction Co., Ltd."

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, December 14th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Ball and Roller Bearings for Coal Mining Machinery." Mr. J. Spiers.

Northampton Engineering College Past Students' Association.—Saturday, December 14th. Criterion Restaurant, London, W.1. 7.30 for 8 p.m. Annual dinner.

Association of Supervising Electrical Engineers.—Tuesday, December 17th. E.L.M.A. Lighting Service Bureau, W.C.2. 7.15 p.m. "Electric Discharge Tubes." Mr. W. Rule.

Illuminating Engineering Society.—Tuesday, December 17th. 35, Russell Square, London, W.C.1. 7 p.m. Joint meeting with the Royal Photographic Society of Great Britain. "The Photographic Representation of Street Lighting Installations." Mr. R. G. Hopkinson.

Institution of Engineers and Shipbuilders in Scotland.—Tuesday, December 17th. Institution, Glasgow. 7.30 p.m. "Diesel-electric Paddle Boat 'Talisman'." Mr. G. A. Inglis.

Institution of Post Office Electrical Engineers (South Western Centre).—Tuesday, December 17th. Royal Empire Society Rooms, Bristol. Joint meeting with I.E.E. Western Centre. "Carrier Telephone Systems." Mr. A. Morris.

Diesel Engine Users' Association.—Wednesday, December 18th. Caxton Hall, S.W.1. 3 p.m. Informal discussion on "High Speed Diesel Engines." Opener, Mr. Oswald Wans.

Institution of Railway Signal Engineers.—Wednesday, December 18th. Institution of Electrical Engineers, London. "Switching of Block Sections." Mr. F. Burton.

Batti-Wallahs' Society.—Thursday, December 19th. Hotel Metropole, W.C. 12.30 for 12.55 p.m. Luncheon. Address by Sir Geoffrey Clarke.

Notes

The Benevolent Association

The Executive Officer of the Electrical Industries Benevolent Association has issued a letter of thanks to all who helped to make the recent Annual Ball a success, most of whom were mentioned in our report (ELEC. REV., Nov. 29th, p. 764). Venner Time Switches, Ltd., and Aron Electricity Meter, Ltd., defrayed the expenses of the band and cabaret.

An effort is being made to stimulate interest in the Association in Manchester. Mr. L. E. Wilson (Hodson's Court, Corporation St., Manchester), who is acting as honorary secretary, has issued an appeal for subscriptions and donations, accompanied by printed enrolment cards. The "Magnet" Amateur Dramatic Society, which is composed solely of members of the G.E.C. Manchester branch is organising a production in aid of the Association. (It will give performances of "I'll Leave it to You" on December 19th and 20th.) This Society, by the way, has done well for the Association during the past two years, having, as the result of similar productions, handed over £70 to the funds.

Generation of Electricity in November

The official returns to the Electricity Commissioners show that 1,758 million kWh of electricity was generated by authorised undertakers in Great Britain during November, as compared with the revised figure of 1,595 million kWh in the corresponding month of 1934, representing an increase of 163 million kWh, or 10.2 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was twenty-six, the same as last year.

During the eleven months of 1935 up to the end of November the total amount of electricity generated by authorised undertakers was 15,635 million kWh, as compared with the revised figure of 13,904 million kWh for the corresponding period of 1934, representing an increase of 1,731 million kWh, or 12.4 per cent.

	1934. kWh (millions).	1935. kWh (millions).	Increase per cent.
January	1,536	1,714	11.6
February	1,343	1,478	10.0
March	1,391	1,507	8.3
April	1,188	1,330	11.9
May	1,125	1,326	17.9
June	1,049	1,147	9.3
July	1,042	1,216	16.7
August	1,059	1,189	12.3
September	1,142	1,320	15.6
October	1,434	1,650	15.1
November	1,595	1,758	10.2

The Electrical Engineers' Ball

We are asked to state that tickets are now available for the next Electrical Engineers' Ball. As already announced here this event will be held on Friday, February 14th, the day after the annual dinner of the Institution of Electrical Engineers. The same lines as last year will be followed in respect of organisation. The proceedings will commence at 8.30 p.m. for 9 p.m. (supper at 11.30 p.m., carriages at 3 a.m.) at Grosvenor House, Park Lane, W. The price of the tickets is one guinea each and they can be obtained from any of the seventy-eight members of the General Committee. The General Committee includes the members of the Committee of Management of the I.E.E. Benevolent Fund, under whose auspices the Ball is being managed. The Executive Committee consists of the following: Messrs. J. R. Cowie, W. G. Hendrey, C. W. Hill, J. M. Kennedy, J. W. Leach, A. M. Sillar, and J. W. J. Townley.

Two Scottish Functions

Mr. E. Seddon, president of the Incorporated Municipal Electrical Engineers Association, proposed the toast of "The Association" at the annual dinner of the Scottish Division of the Electrical Power Engineers' Association at Edinburgh on December 7th. As an industry, he said, they had grown so fast that the recent appointment of a Government committee of investigation was an indication that the time had arrived when they must enlarge their areas of supply and conduct their business on common lines with their neighbours for the benefit of the consumer. It was anticipated that the change of policy advocated in responsible quarters would bring increased business through the employment of engineers suitably trained in development work and, in turn, would create a further demand for distribution engineers. The E.P.E.A., continued Mr. Seddon, was growing from strength to strength. There was an increase of 214 members in 1934 over 1933, and a further increase of 226 members in 1935 over the previous year. The Scottish members numbered 469, or nine per cent. of the total membership of 5,300. Mr. C. Cooper, Woolwich, president of the Association, in the course of his reply, said that the power companies of the United Kingdom were represented on the National Board. There was, therefore, no reason why the Scottish power companies should not be similarly represented on the Scottish District Joint Boards.

The important part played by electrical engineers in the mining industry was commented on at the annual reunion dinner of the West of Scotland Branch of the Mining Elec-

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. A. E. McKenzie, borough electrical engineer, Wimbledon, has been invited by the Central Electricity Board to become a member of the National Consultative Committee, established under the Electricity Supply Act, 1926.

[*Elliott & Fry*
Mr. E. E. Jolly

Mr. E. E. Jolly, deputy borough electrical engineer and manager with Ilford Corporation, has been appointed electrical engineer and manager to the Bethnal Green Borough Council. Mr. Jolly received his electrical training at the University College, Southampton, and with the Southampton Corporation electricity undertaking, and afterwards joined the staff of the latter. He subsequently held two appointments in the St. Helens (Lancs) Electricity Department, and took up his position at Ilford in April, 1932. He took a leading part in the reorganisation of plant, e.h.p. and l.p. switchboards, distribution system and change-over at St. Helens and Ilford. He has greatly assisted in the growth of the Ilford undertaking during the past three years, particularly in the progress of domestic electrification, including the installation of many thousands of electric cookers. For eight years he was chairman of the Social Club at St. Helens and has occupied the same position at Ilford. He is an associate member of the Institutions of Electrical and Mechanical Engineers. He served throughout the war with the R.F.C., and rose to the rank of flight-commander.

Mr. A. E. Tattershall, signal and telegraph engineer, North Eastern Area, London and North Eastern Railway, has been appointed signal and telegraph engineer, Southern Area, in succession to Mr. F. Downes, who is retiring shortly.

Mr. H. F. D. Page, has been appointed chief signal and telegraph engineer to the Great Western Railway, in succession to Mr. C. M. Jacobs, who will retire from that position on February 1st next. Mr. Page has been principal assistant since April last.

Mr. W. E. Budding, of the South Wales Electric Power Co., was recently entertained at a complimentary luncheon when a presentation was made to him to mark his retirement from the secretaryship of the District Joint Board and the District Joint Council for the Electricity Supply Industry which he has held for thirteen years. He is leaving the South Wales Power Co. shortly to take up a position in London. The luncheon was presided over by Mr. L. Howles, general manager of the South Wales Power Co., and Ald. A. E. Gough (chairman of the Cardiff Corporation Electricity Committee) made the presentation.

Prof. W. M. Thornton, of Armstrong College, Newcastle-on-Tyne, shared the first prize of £50 at the Northern Exhibition of Inventions at Newcastle for a miners' electric lamp for measuring fire damp. The other participant was Mr. D. Brown, of Blaydon Iron Works.

Mr. D. P. Sayers is leaving the Belfast office of Messrs. Kennedy & Donkin early in January next to take up the appointment of deputy operation and mains engineer with the Sheffield Corporation Electricity Department. Mr. Sayers recently contributed two articles to our pages upon the Northern Ireland change-over.

Mr. F. S. Hayburn, managing director of the Marconi International Marine Communication Co., Ltd., and of the Marconi Sounding Device Co., Ltd., has been appointed Foreign Envoy of the Marconi group of companies. He joined the Marconi International Marine Co. in 1904, and had experience on the Continent with the Marconi group from 1906 to 1920, returning to London in the latter year. He was appointed assistant general manager of the Marine Company in 1922, manager in 1925, general manager in 1927, director and deputy managing director in 1928, and managing director in 1933 in succession to the late Rt. Hon. F. G. Kellaway. The new appointment will take effect as from the end of the current year, but Mr. Hayburn will continue to act as director of the Marconi Marine & Sound Device Companies and of the Norsk Marconikompani and the Société Anonyme Internationale de Télégraphie sans Fil, of Brussels. He will leave England for the East, on his first foreign mission, early in the New Year, and will be succeeded in the managing directorship of the Marine Company by **Mr. H. R. C. Van de Velde,** general manager of Marconi's Wireless Telegraph Co., Ltd.

[*Marlborough Gravure Service*
Mr. F. S. Hayburn

Dr. H. Herman, engineer-in-charge of briquetting and research for the Victoria Electricity Commission, is paying a visit to this country. He is the Victoria Government's representative on the committee appointed by the Australian Government to inquire into the relative merits of black and

Notes *(Continued from preceding page)*

trical Engineers at Glasgow on December 7th. Lieut.-Colonel A. D. McInnes Shaw, proposing the toast of "The Association," mentioned that they were celebrating that night their silver jubilee as an association. Mr. A. W. Williams, Nottingham, president of the Association, replied. Professor A. M. Bryan responded to the toast of "The Guests." Mr. Williams presented replicas of the president's badge to the following ex-presidents: Mr. Alexander Anderson, Mr. Matthew Brown, Mr. A. B. Muirhead, Mr. David Martin, Mr. Frank Anslow, and Mr. Frank Beckett.

The E.A.W.

The first annual luncheon organised by the Worsley branch of the Electrical Association for Women was held at the Walkden Town Hall on December 5th and presided over by Mrs. J. Fearnley. The attendance numbered more than seventy. Miss Haslett outlined the activities of the Association in response to a toast proposed by Mr. T. C. S. Arnett (C.E.B.). Those present included Mrs. Z. de Ferranti, Miss Foster Jeffrey, Mr. L. Heywood, Director of Housing to Manchester Corporation, the Rev. I. Renshaw, Mr. E. Tonge, a local builder; also Messrs. J. S. Foreman, N. H. Bridge, and F. Collinge, of the Lancashire Electric Power Co., and Mr. and Mrs. Hutchinson. Mrs. F. Collinge is the honorary secretary, and Mrs. J. Foy the chairman of the Worsley branch.

Eighty-five ladies were present at the inaugural meeting of the new Leicester Branch of the Association held at the Corporation Electricity Department's showrooms in Market Street on November 28th. The aim of the Association to be, above all else, practical, was emphasised by Miss Haslett, in referring to the all-electric house built by the Association at Bristol. Mrs. J. C. Munro is chairman of the new branch and Mrs. Astley Clarke vice-president, the other officials being Mrs. B. Gill, hon. treasurer, Miss Exton and Miss Whittle, joint hon. secretaries.

Appointments Vacant

Lady demonstrator and showroom assistant for Poplar Electricity Department.

Deputy borough electrical engineer and manager for Ilford Electricity Department.

Borough electrical engineer for South Shields Corporation (salary £700, rising to £800 per annum).

Draughtsman and plumber jointers for Ipswich Electric Supply and Transport Department.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

BEEMAC 5-A switch.
PARAGON switchgear.
MAGNUM hair dryer.

Readers should enclose stamped addressed envelopes when making their inquiries.

brown coal for hydrogenation. He will extend his investigations to Germany, where he will inquire into the latest practices in briquetting to enable his Commission, if occasion requires, to expand the Yallourn briquette factory.

Mr. F. C. Orchard, who recently resigned his appointment of assistant engineer with the Birmingham Corporation Electric Supply Department to take up the position of borough electrical engineer of Hornsey, has been presented with a standard lamp by the staff of the Department and a dinner wagon by his colleagues in the Frequency Change Department. The presentations were made by Mr. F. Forrest, city electrical engineer.

The Metropolitan-Vickers Electrical Export Co., Ltd., has appointed as directors Messrs. I. R. Cox, H. L. Guy and G. A. Juhlin, all of whom are members of the parent company's staff.

Mr. I. R. Cox was apprenticed to the British Westinghouse Co., and in 1913 was appointed assistant turbine engineer at Trafford Park, in which capacity he remained until enlisting in 1914. From then until 1919 he was on active service with the Royal Artillery, in which he ultimately commanded a brigade and retired with the rank of major. During the war he was mentioned twice in despatches and was decorated with the D.S.O. and the Croix de Guerre. From 1919 Mr. Cox was turbine engineer at Trafford Park, leaving in 1927 to work in Russia as chief mechanical engineer for the M.-V. Co. in charge of turbine activities. He subsequently visited Australia and America on the company's business. More recently Mr. Cox has been at the Export Co.'s headquarters in London. He is an associate member of the Institution of Civil Engineers.

Mr. H. L. Guy entered the mechanical engineering side of the Metropolitan-Vickers Electrical Co., Ltd. (then the British Westinghouse Co.) in 1910, being appointed chief engineer of the Mechanical Department in 1921. He has been a member of the North-Western Branch Committee of the Institution of Mechanical Engineers since 1926, and was branch chairman. Since 1928 he has been a member of Council of the Institution. He has contributed many papers on technical subjects to this and other engineering bodies, one of his contributions, "The Economic Value of Increased Steam Pressure," winning for him the Hawksley Gold Medal of the Institution. Mr. Guy has on three occasions been a member of the British Delegation to the International Steam Tables Conference; he is chairman of the Pipe Flanges Research Committee of the Institution of Mechanical Engineers, a member of the Research Committee of the Institution of Civil Engineers, and a member of the National Physical Laboratory Advisory Committee for Metallurgical and Engineering Research on Materials.

Messrs. I. R. Cox, H. L. Guy and Mr. G. A. Juhlin who have been elected to the board of the Metropolitan-Vickers Electrical Export Co., Ltd.

Mr. G. A. Juhlin was born and educated in Sweden and commenced engineering in this country in 1913, when he joined Dick, Kerr & Co., Preston, remaining with them until 1915. During the last eight years of that period he held the position of chief a.c. design engineer. He joined the then British Westinghouse Co. in 1915, and two years later was appointed chief engineer of the Plant Department, covering the design of the company's heavy electrical products. He is a member of the Institution of Electrical Engineers, and was chairman of the North-Western Centre for 1923-24; he is still a member of the Committee of that Centre. He has contributed a number of papers on design subjects to the Institution. In 1925 Mr. Juhlin visited the Far East on behalf of the Metropolitan-Vickers Electrical Co., Ltd.

Mr. M. J. Railing, vice-chairman of the General Electric Co., Ltd., was inaugurated as Master of the Worshipful Company of Makers of Playing Cards on December 2nd. The inauguration dinner took place on that day at the Salters' Hall, with Mr. Railing presiding, and Sir Percy Vincent, the Lord Mayor of London, as the principal guest. Amongst those present were Lord Hirst, Sir John Brooke, Sir Newton Moore, Sir William Noble, Dr. A. H. Railing, Mr. L. C. Gamage, Mr. C. Wilson, Mr. S. D. White, Mr. J. Y. Fletcher, and Mr. F. Winstanley.

Mr. D. J. Hastings and **Miss A. E. Frampton,** members of the staff of the Norwich Corporation Electricity Department, who were recently married, have been presented by their colleagues with a vacuum cleaner and a walnut floor standard lamp.

Mr. C. D. McLaughlan, superintendent of telegraphs at Melbourne, is retiring. He joined the department in 1912, and in 1927 was appointed superintendent at Perth, being transferred to Melbourne four years later.

Mr. W. S. Ibbetson, B.Sc., A.M.I.E.E., has been appointed examiner in electro-technology at the forthcoming first associate membership examination of the Institute of Marine Engineers.

Obituary

Mr. J. A. Crabtree.—By the death of Mr. John Ashworth Crabtree, to which brief reference was made in our last issue, Walsall has been robbed of one of its most interesting and progressive personalities, and the electrical industry of a man who, in a comparatively brief period, built up a large manufacturing business with conspicuous planning and foresight. He was the founder and head of the well-known accessories and switchgear manufacturing company which carries on operations at Lincoln Works, Walsall, under the name of J. A. Crabtree & Co., Ltd. "J.A.C." was so real a friend to everybody there that it is without surprise that one learns that his death so unexpectedly and at so early an age as 49, filled them with a numbed sense of personal loss. In B.E.A.M.A. circles, where he had many friends, his abilities were fully recognised, and outside the electrical world he was held in very high esteem as a prominent Rotarian; indeed the Rotary movement was probably the foremost of his general interests and he had travelled much in recent years making contact with fellow Rotarians in many lands. Mr. Crabtree was born in Rochdale in 1886; at an early age he lost his father, and in addition he found the industrial Lancashire of his childhood very forbidding, so he started under great difficulty to make his way alone. It is pleasing to know that all through his life he had shown great keenness in avoiding in his own affairs anything approaching the old-time factory atmosphere and conditions. Having to start his career early, he became apprenticed to a Birmingham electrical manufacturer and later found his way to the drawing office, where he showed a high order of designing ability; during the war he displayed great inventive ingenuity. The company which bears his name came into existence soon after the war at a small factory in Rushall Street, Walsall; the existing works in Lincoln Road was started in a small two-storeyed building in 1923, and its remarkable growth in the subsequent twelve years is well known. Mr. Crabtree had the gift, so essential in building up a business of character, which was designed to last through the years, for gathering about him and training men for leading positions in which they would share responsibility with him; thus it happens that he has left behind in charge of the company's operations and affairs men with whom he had long been in constant association. Much might be said, with Mr. Crabtree's career as a text, for the encouragement of young men who begin life handicapped or alone, but we must refrain. It is essential, however, to select two points for mention. They are: first, his knowledge of economics coupled with a very keen study of world trade and finance, and international control movements. He wrote a signed article for the ELECTRICAL REVIEW (July 4th, 1930, page 479) on the "British Electrical Industry during the next Decade" in which, at a time of crisis, he examined the then prevailing tendencies and drew certain conclusions. He was also a profound believer in business research and forecasting, a subject upon which he spoke at length in London in the same year (ELECTRICAL REVIEW, May 9th, 1930, p. 884), and one which is coming into more general approval every year. Secondly, we should refer to his skill as an artist, which reference at this season of the year will bring to the recollection of at least some of his friends the charming sketches of places visited during vacations which it was his and Mrs. Crabtree's custom to send with annual greetings. He has left a widow and two sons with whom deep sympathy is being expressed by a host of friends at home and overseas.

The following were among those present at the funeral ceremony, which took place at Little Aston Parish Church on Friday last: Mr. J. Crabtree (son), Mr. H. Crabtree (brother), Mr. E. Badham (brother-in-law), the Mayor and Town Clerk of Walsall, representatives of Rotary International, Walsall and Birmingham Rotary Clubs, representatives of Masonic lodges, Birmingham University, Walsall Chamber of Commerce and other bodies, Mr. Quance, of the G.E.C., Mr. Mills (M.K. Electric, Ltd.), Messrs. Read and Millard (Walsall Conduits, Ltd.), Mr. Birkett (M.E.M., Ltd.), Mr.

Murgatroyd (Mather & Platt, Ltd.), and Mr. Tucker (Tucker & Co.). From Messrs. J. A. Crabtree & Co., Ltd., there were: Mr. A. Parker (late works manager), Mr. Harper (director), Mr. McLoughlin (general manager), Mr. Harrison (works manager), Mr. Aston (sales manager), and Mr. Stanford (London manager).

Herr K. Lehrke.—The death occurred recently at Johannesburg, of Mr. Karl Lehrke, a director of the A.E.G., Berlin. Mr. Lehrke was in South Africa on a business visit.

Will.—**Sir John Pybus,** former managing director of the English Electric Co., Ltd., and a director of a number of other companies, left £92,026 (net personalty £88,110). The various bequests totalled £55,600, and the residue of the property is left to special trustees, to apply the income at their discretion for the purpose of assisting the education and advancement in life of such boys and young men of the artisan class as shall be under twenty-five years of age, born within twenty-five miles of Hull or Bradford, who shall have resided there for not less than five years.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

H. A. Simons & Co., Ltd.—Private company. Registered December 2nd. Capital, £500 in £1 shares. Objects: To carry on the business of display fittings specialists, manufacturers of and dealers in window advertisement appliances, electrical, neon, and shop fittings, &c. The directors are: H. A. Simons, 109, Clive Court, Maida Vale, W., and R. Webb, 26, Wardrobe Chambers, 146a, Queen Victoria Street, London, E.C.4. Secretary: R. Webb. Registered office: Poland House, 167, Oxford Street, London, W.1.

Pilot Radio, Ltd.—Private company. Registered November 30th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers and distributors of and dealers in wireless, gramophones and sound reproducing machines, radio and electrical engineers, &c. The directors are: H. L. Denton, 114, Dorchester Avenue, Palmers Green, London, N., and J. C. E. Osborne, 99, Harrowdene Road, N. Wembley. Registered office: 6, Queen Street, Mayfair, W.1.

Ismay Boro Tube Light, Ltd.—Private company. Registered December 3rd. Nominal capital, £5,000 in £1 shares. Objects: To adopt an agreement between Odhams Press, Ltd., Hermann Mayer and this company, for the acquisition of certain rights and interests of Odhams Press, Ltd., including the benefit of an agreement dated May 15th, 1933, between the said company and H. Mayer, to manufacture, or deal in and with electric lamps (including particularly tubular lamps illuminated by incandescent filament in which the company intends to deal in the first instance) and electrical plant, apparatus and machinery of all kinds, &c. The subscribers are: G. S. Rate, Glenelly, Adleigh Green Road, Hornchurch, and M. Pollock-Hill, St. Bartholomew's Vicarage, Stamford Hill, London, N.15. The first directors are: J. Ismay, T. S. Cornwell, and H. Mayer. Registered office: Sterling Works, Dagenham, Essex.

People's Electric Stores, Ltd.—Public company. Registered December 7th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical, mechanical, wireless, television, telephone, lighting, heating, motor and general engineers; engineering and electrical installation contractors; repairers, factors of, agents for the sale of (on hire-purchase or easy-payment systems or otherwise) and dealers in electrical and lighting and heating apparatus, &c. The directors are: A. D. Webber, 24, Wilmslow Road, Didsbury, Manchester, and J. B. Teasdale, 4, St. Mary's Parsonage, Manchester.

Beaver Radio (L'pool), Ltd.—Private company. Registered December 7th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless, television and telephonic receiving and transmitting apparatus, &c. The directors are: P. E. Beaver, and Mrs. R. Beaver, both of 27, Grove Park, Liverpool. Registered office: 60 and 62, Whitechapel, Liverpool.

Twentieth Century Radio & Lighting Co., Ltd.—Private company. Registered December 6th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in wireless and television sets, accessories and apparatus, gramophone and records, &c. The directors are: Mrs. M. Quint, 9, Sunset Road, Denmark Hill, London, S.E.5, and L. M. Manship, 199, Whitton Road, Twickenham. Registered office: 24, Camberwell Green, S.E.5.

Flow-Neon Signs, Ltd.—Private company. Registered December 6th. Capital, £2,400 in 5s. shares. Objects: To acquire and develop the rights and interests of the inventors in an invention relating to improvements in luminous electric discharge tubes, signs and designs for which letters patent have been granted under No. 399566 to G. C. Adams and A. R. Warner, and also inventions relating to improvements in luminous tube signs or designs operated by high frequency currents for which letters patent have been granted under No. 423362 to A. R. Warner, and to carry on the business of manufacturers, erectors and maintainers of metal, electric and other signs, &c. The directors are: A. R. Warner (permanent managing director), 29, Abbey Road, St. John's Wood, London, N.W.8, H. J. Spiller, Gainsborough House, Ferndene Road, Herne Hill, London, S.E.24, and two others.

Cheltenham Meters, Ltd.—Private company. Registered December 5th. Nominal capital, £10,000 in £1 shares (4,000 "A," 4,000 "B," and 2,000 ordinary). Objects: To Manufacture, import, export, repair and recondition, and deal in, maintain, and let on hire or hire-purchase gas, electricity and water meters of all kinds, pipes, fittings, stoves, engines, appliances, machines and other apparatus, &c. The subscribers are: C. S. Neil, 155, Kew Road, Richmond, Surrey; and R. H. Studholme, 15, Moorgate, London, E.C. Solicitors: Slaughter & May, 18, Austin Friars, E.C.

Scottish Radio Industries, Ltd.—Private company. Registered in Edinburgh December 5th. Capital, £2,000 in 1,500 6 per cent. non-cumulative redeemable preference and 500 ordinary shares of £1 each. Objects: To carry on the business of radio service factors, manufacturers and factors of radio receivers and transmitters and all parts and components thereof, &c. The subscribers are: H. P. Samwell, The Rectory, Kerse Lane, Falkirk; and W. C. T. McEwing, Rosehill Cottage, Duke Street, Denny. H. P. Samwell is the first director. Registered office: 36, Stirling Street, Denny.

J. D. Taylor (Radio), Ltd.—Private company. Registered November 4th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless and television sets and apparatus, &c. The subscribers are: J. D. Taylor and Mrs. Lilian Taylor, both of "Zylpha," Mount Vernon Crescent, Barnsley.

Returns of Electrical Companies

Midland Electric Light & Power Co., Ltd.—The nominal capital has been increased by the addition of £150,000 in £1 shares beyond the registered capital of £100,000. The 10,000 shares of £10 in the original capital have been sub-divided into 100,000 shares of £1 each. At March 7th, 1935, the Midland Counties Electric Supply Co., Ltd., held 9,677 shares of £10 out of 10,000 issued.

E.S.S. Signs, Ltd.—Debenture, dated November 22nd, 1935, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Branch Nominees, Ltd.

L.R. Supply Co., Ltd.—Satisfaction in full on November 27th, 1935, of debentures authorised July 4th, 1935, and registered July 8th, 1935, securing £300. Debenture, dated November 27th, 1935, to secure £2,500, charged on the company's undertaking and property, including uncalled capital. Holder: W. Prince, "Silvermead," Staines.

General Wireless Relay Co., Ltd.—Particulars filed on November 29th, of debentures to secure £30,000 and maximum premium of 19 per cent., authorised August 9th, 1935, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £4,000.

Exe Valley Electricity Co., Ltd.—The nominal capital has been increased by the addition of £25,000 in £1 ordinary shares beyond the registered capital of £150,000.

Isle of Thanet Electric Supply Co., Ltd.—Satisfaction to the extent of £40,739 on October 31st, 1935, of charges dated January 18th, 1902, and September 15th, 1924, and registered January 20th, 1902, and September 19th, 1924, securing £150,000 and £400,000 debenture stock respectively.

London Electric Appliances, Ltd.—Debenture, dated November 21st, 1935, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: W. Barrow, 3, Grantham Place, Park Lane, London, W.1.

Lightfoot Refrigeration Co., Ltd.—Satisfaction (1) in full on March 7th, 1935, of mortgage dated December 1st, 1928, and registered February 19th, 1929, securing Rs. 718462/8. (2) in full on August 1st, 1933, of charge dated July 28th, 1932, and registered August 8th, 1932, securing £6,330, and (3) to the extent of £4,000 on October 18th, 1935, of trust deed dated December 31st, 1928, and registered January 4th, 1929, securing £200,000 6½ per cent. debentures. (Notices filed November 28th, 1935.)

Murphy Radio, Ltd.—Capital, £20,900 in 17,900 ordinary, 2,500 "A" ordinary, and 500 preference shares of £1. Return dated June 26th (filed August 29th), 1935. 16,501 ordinary, 2,500 "A" ordinary and 500 preference shares taken up. £15,254 paid, £3,997 considered as paid. Mortgages and charges, nil.

Whitehead's Electrical Inventions, Ltd.—Capital, £1,000 in £1 shares. Return dated July 9th, 1934 (filed August 20th, 1935). All shares taken up. £1,000 paid. Mortgages and charges, nil.

Public Utilities (Electric), Ltd.—Capital, £25,000 in £1 shares. Return dated August 13th, 1935. All shares taken up. £15,625 paid (£1 per share on 12,500 and 5s. per share on 12,500 shares). Mortgages and charges, nil.

Anglo-Argentine Tramways Co., Ltd.—Capital, £11,000,000 in 800,000 5½ per cent. 1st cumulative preference and 710,000 6 per cent. 2nd cumulative preference shares of £5, and 862,500 ordinary shares of £4. Return dated August 6th, 1935. 640,000 1st preference, 610,000 2nd preference, and 675,000 ordinary shares taken up. £850,000 paid on 20,000 1st preference and 150,000 ordinary shares, £8,100,000 considered as paid on the remainder. Mortgages and charges: £70,660 annuity, £4,465,674 4 per cent. debenture stock, £1,733,380 4½ per cent. debenture stock and £6,000,000 5 per cent. debenture stock.

Electrical Finance & Securities Co., Ltd.—Satisfaction to the extent of £4,817 on October 31st, 1935, of trust deeds dated July 29th, 1927, July 6th, 1928, April 24th, 1930, and January 29th, 1932, and registered July 29th, 1927, July 10th, 1928, April 29th, 1930, and February 1st, 1932, respectively.

Musselburgh & District Electric Light & Traction Co., Ltd.—Satisfaction to the extent of £1,500, on November 27th, 1935, of debentures authorised by resolutions of November 13th, 1905, and April 8th, 1909, and registered May 12th, 1909, securing £90,000.

Toolecto, Ltd.—Debenture dated October 24th, 1935, to secure £400, charged on the company's property, present and future, including uncalled capital. Holder: A. Bronstein, 2, Eatington Road, Leyton, London, E.10.

G.W.B. Electric Furnaces, Ltd.—Capital, £2,000 in £1 shares. Return dated August 1st, 1935. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Ringwood Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares beyond the registered capital of £15,000. At May 31st, 1935, the British Power & Light Corporation, Ltd., held 10,553 shares out of 11,356 issued.

West Hampshire Electricity Co., Ltd.—The nominal capital has been increased by the addition of £70,000 in £1 ordinary shares beyond the registered capital of £30,000. At May 31st, 1935, the British Power & Light Corporation, Ltd., held 28,743 shares out of 30,000 issued.

South Somerset & District Electricity Co., Ltd.—The nominal capital has been increased by the addition of £55,000 in £1 ordinary shares beyond the registered capital of £20,000. At May 31st, 1935, the British Power & Light Corporation, Ltd., held 18,743 shares out of 20,000 issued.

Trent Valley & High Peak Electricity Co., Ltd.—The nominal capital has been increased by the addition of £80,000 in £1 ordinary shares beyond the registered capital of £20,000. At May 31st, 1935, the British Power & Light Corporation, Ltd., held 18,743 shares out of 20,000 issued.

West of England Electric Investments, Ltd.—The nominal capital has been increased by the addition of £100,000 in £1 ordinary shares beyond the registered capital of £500,000. The new shares were allotted, for cash, to John L. Walsh and John S. Evernden (jointly), of 47, Parliament Street, S.W.1, on November 29th, 1935.

Electric Art Shades (1928), Ltd.—Capital, £500 in £1 shares. Return dated August 22nd, 1935. All shares taken up. £500 paid. Mortgages and charges: £450.

La Plata Electric Tramways Co., Ltd.—Capital, £450,000 in 200,000 preference and 250,000 ordinary shares of £1. Return dated August 15th, 1935. All shares taken up. £170,007 paid on 170,007 preference shares, £279,993 considered as paid on 29,993 preference and 250,000 ordinary shares. Mortgages and charges: £78,300.

Rural Electricity Supply Co., Ltd.—Capital, £10,000 in 9,500 preference shares of £1 and 10,000 deferred shares of 1s. Return dated August 3rd, 1935. 5,512 preference and 5,713 deferred shares taken up. £3,156 13s. paid on 2,871 preferred and 5,713 deferred shares, £2,641 considered as paid on 2,641 preferred shares. Mortgages and charges, nil.

Tungstone Accumulator Co., Ltd.—Capital, £1,000 in £1 shares. Return dated August 8th, 1935. 500 shares taken up. £500 paid. Mortgages and charges, nil.

Sloan Electrical Co., Ltd.—Capital, £60.000 in 10,000 preference and 50.000 ordinary shares of £1. Return dated August 29th, 1935. 8,000 preference and 40,000 ordinary shares taken up. £41,500 paid on 3,000 preference and 38,500 ordinary shares. £6,500 considered as paid on 5,000 preference and 1,500 ordinary shares. Mortgages and charges: £60,500.

Bostock & Bramley, Ltd.—Capital, £10,000 in £1 shares. Return dated August 2nd, 1935. 8,950 shares taken up. £5,552 paid, £3,398 considered as paid. Mortgages and charges, nil.

Allen & Welsby, Ltd.—Capital, £1,500 in £1 shares. Return dated August 20th, 1935. 1,060 shares taken up. £1,060 paid. Mortgages and charges, nil.

Ellis & Ward, Ltd.—Capital, £10,000 in 2,000 preference and 8,000 ordinary shares of £1. Return dated August 20th, 1935. 1,000 preference and 6,003 ordinary shares taken up. £1,003 paid on 3 ordinary and 1,000 preference shares, £6,000 considered as paid on 6,000 ordinary shares. Mortgages and charges, nil.

City Notes

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd. (which is now a subsidiary of the British Tyre & Rubber Co., Ltd.), held its annual meeting on Tuesday last, when Sir Walrond Sinclair (chairman), who presided, said that the net profit for the year was almost double that of the previous year. Freehold premises in Liverpool, which had been vacant and unproductive for some years, had been disposed of and important developments were in hand in connection with the Silvertown factory. During the past two years consideration had been given to the modernisation of this factory, and it became evident that new works could be built, concentrated round the existing sources of power supply, which, when completed, would occupy a substantially smaller area than before. The work was already in progress, and would be spread over two years in order to avoid as far as possible interference with production. The first part of the reconstruction programme would cost about £150,000. The surplus land which would result from these activities was recently sold. Referring to the factory in Buenos Aires, the chairman said that its re-equipment had been proceeded with with satisfactory results, and it was responding to the better internal conditions experienced in Argentina. With regard to the business as a whole the confidence of their customers had been retained and the turnover had increased to a gratifying extent. There had been a marked expansion in the more profitable lines of their export business, despite the difficulties of international trade. In the first two months of the current year there had been an increase of business.

The Associated Equipment Co., Ltd.—Presiding at the annual meeting held on December 9th, Mr. C. W. Reeve (chairman and managing director), in the course of his speech referred to the reward obtained by the company for the care and attention given in recent years to the development of the electric trolley-bus. During the past year 388 trolley-buses had been ordered from the company. Of these, 252 were for the London Passenger Transport Board and seventy-six for the Portsmouth Corporation. The orders for trolley-buses supplied to the London Passenger Transport Board were obtained in open competition, since the long-term contract with that authority did not include that particular type of vehicle. The special design of oil engine now marketed by the company for marine and industrial purposes had received general acceptation.

Tube Investments, Ltd., held its annual meeting on December 4th, when Mr. Arthur Chamberlain (chairman), who presided, said that the last three years had witnessed a remarkable increase in the turnover, and the results for the year under review were the most successful yet recorded. It was proposed to capitalise a sum equal to one in ten of the ordinary and 1,000 in ten of the liaison ordinary capital for distribution to shareholders.

At an extraordinary meeting, which preceded the annual meeting, resolutions were passed increasing the capital to £4,300,000 by the creation of 1,000,000 new shares of £1 each and authorising the necessary alterations in the articles of association.

The British Vacuum Cleaner & Engineering Co., Ltd., reports an increase in the net profit for the year to September 30th last from £40,275 to £60,769 and proposes to raise the dividend from 33⅓ per cent. to 66⅔ per cent. The reserve is to be brought up to £75,000 by an allocation of £35,000 and £8,107 is to be added to the income-tax reserve, leaving £12,090 to be carried forward (against £9,789). The directors state that the public demand for "Goblin" vacuum cleaners has further increased and new records have been established both in turnover and profit. Meeting: December 16th.

The General Cable Manufacturing Co., Ltd.—The first report of this company, which was incorporated on November 1st, 1934, shows a net trading profit for the twelve months to September 30th last of £21,177, from which is deducted £1,963 for depreciation, and £751 for directors' and audit fees. A final ordinary dividend of 5 per cent. is recommended, making 10 per cent. for the year, income tax takes £1,100, preference dividend £3,750, and reserve £3,000, leaving a balance of £1,174 to be carried forward. Meeting: December 12th.

Aron Electricity Meter, Ltd., is maintaining its interim ordinary dividend at 5 per cent.

The Compania Hispano-Americana de Electricidad S.A. ("Chade"), has declared an interim dividend of 20 Argentine paper pesos in respect of series "A," "B" and "C," and 4 Argentine paper pesos in respect of the series "D" and "E." Last year's interim was at the rate of 16 gold pesetas for series "A," "B" and "C," and 3.20 gold pesetas for series "D" and "E."

The Palestine Electric Corporation, Ltd., has declared an interim dividend of 2½ per cent., free of United Kingdom tax, on the ordinary and "A" ordinary shares. No interim dividend was paid last year, but the final distribution was 7½ per cent., tax free.

Edmundsons Electricity Corporation, Ltd., reports that the results of the operations of its group of companies during November as compared with the corresponding month of 1934 show an increase of 15 per cent. of kWh sold.

The Globe Telegraph & Trust has announced a quarterly dividend of 1s. 6d. per share net on the ordinary shares (against 1s.).

The Brazilian Traction, Light & Power Co. has announced a quarterly dividend of 1½ per cent. on the preference shares.

The British Columbia Power Corporation is paying a quarterly dividend of 37 cents on class "A" shares (unchanged).

E. K. Cole, Ltd., announce an interim ordinary dividend of 12½ per cent., less tax, as compared with 10 per cent. last year.

Stocks and Shares

TUESDAY EVENING.

STOCK Exchange markets are unusually active for this time of year. Several important factors contribute to this state of affairs, the first being the return of the National Government; the second, the remarkably cheap borrowing that the Treasury has just achieved; and, in the third place, the anxiety on the part of capital to acquire investments rather than to leave the cash on deposit at the banks over the year-end. Instead of there being the accustomed window-dressing that December generally brings, marked readiness prevails, on the part of investment, to get its money settled into stocks and shares with as little delay as possible.

"Not to Press"

Many features are to be found throughout the markets. One of them is the strength and popularity developed by shares in the electrical equipment and manufacturing branch of the industry. It is nothing out of the way, at the present time, for would-be buyers of electrical equipment shares to be told that, if they do make a purchase, it must be on condition that they shall not unduly press for delivery, should the seller be unable to obtain shares with which to satisfy the buyer for the ordinary Stock Exchange Account Day. Such bargains are definitely done "not to press." If a client asks what is a reasonable time within which to expect delivery of his stock under such conditions, he may be told that six to eight weeks will possibly elapse before delivery can be ob-

tained, although this entirely depends, of course, upon the supply that happens to come to market. Cases have been known, by the way, in which buyers have waited twelve months for the fulfilment of bargains, during which time there is no necessity for them to put up the money in payment for the stock, while, on the other hand, any dividends &c., that accrue are paid to them.

Gilt-edged Stocks

Once more the tendency in gilt-edged securities has been in the upward direction. Central Electricity issues are better than they look, to adopt the Stock Exchange phrase. That is to say, quotable changes are negligible, but in actual fact, stocks are difficult to buy. London Passenger Transport "C," at 109, has risen to its record price so far, and the 4½ per cent. "A" stock, at 122¼, is again a point to the good. The 5 per cent. "A" stock can be sold at 133, ex the interest due next New Year's Day. London Power 5 per cent. debenture has firmed up to 109½.

Electricity Supply Shares

These are steady without showing any particular feature. Metropolitans have recovered to 52s., and in the Scottish shares, Clyde Valley are better at 44s. Edmundsons ordinary, Midland Counties and Yorkshires are better. In the other London, Provincial and Scottish companies' shares, there is no particular change. Some of the overseas issues are better, Perak, for instance, spurting to 20s. 9d. Palestine "A" have risen to 51s. 3d. Atlas at 5s. 9d. are a few pence harder. British Light and Power at 29s. 7½d. also show a small improvement.

Crompton Parkinson

The meteoric rise in Crompton Parkinsons which carried the price to 125s. had the natural effect of bringing in a certain amount of profit-taking. The price dipped to 117s. before it rallied to 6/16s, at which the supporters of the shares steadfastly maintain that this level is intrinsically too low for the shares to occupy. These same supporters look forward to the time when the price shall be quoted ex everything, and, as pointed out here a fortnight ago, divided by two, by reason of the doubling of the capital through the issue of the share-for-share bonus.

Other shares in this group are notably good. There has been, for instance, a florin rise in General Electric ordinary, which lifted the price to 74s., though, singularly enough, the 6½ per cent. preference shed a few pence to 32s. 6d. An unexplained demand sprang up for British Insulated, the shares coming into request at £5, at which they show a rise of 5s. on the week. Callender's are a little better at 3½, and Henley's hold their rise at 7½. This group as a whole is decidedly good. A sudden jump to 27s. 6d. in the price of Siemens was accompanied by talk of a probable increase in the dividend; 4 per cent. was paid for last year. The company's £0 per cent. preference, which were standing about 56s. 3d., advanced, in sympathy with the ordinary shares, to 37s., being in scarce supply and, at the same time, in pressing request by investors from the North. Enfield Rolling Mills failed to make any headway, the price keeping dull at 22s. 6d. Ericssons rose 1/8 to 37s. 6d. Telephone Manufacturing are firm at 8s. 3d. buyers. Telephone Rentals at 9s. 7½d. are a little below their recent best.

Associated Electrical Industries are the centre of active attention; at 44s. the price is 3s. higher. British Aluminiums, after their abrupt drop to 40s. 3d., have come back equally quickly to 44s. English Electrics and Electric Construction are harder.

Cable and Wireless

The anxious search for investments and speculative investments in companies that are likely to feel the benefit of increased trade is responsible for fresh rises in Cable and Wireless stocks. The preference has risen to 106 and the ordinary, after going to over 30, reverted to 29½. Globe Telegraph and Trust ordinary and preference hold their good rises of a week ago. Great Northern Telegraphs followed up their 10s. rise with another of similar extent, the price now being 41. Anglo-American Telegraphs are better. American Telephone and Telegraphs at 162½ show a recovery of 5 points; International Telephone and Telegraph, after a spurt to 14⅜, subsided to 14, which leaves the price 1¼ better than it was a week ago.

The tendency of Americans generally has been upward. The bullish sentiment recently so prominent in Wall Street gives no indication of a decline, save that, every now and then, there comes what Stock Exchange men and newspaper financial articles are accustomed to term, to the exasperation of clients, a "healthy reaction."

Miscellaneous Matters

One hundred points rise is the score made this week by the meteoric British Electric Traction deferred stock. The company's 8 per cent. preferred ordinary is up 5 at 173½. Tramway and traction issues of all kinds are a good market, prices advancing almost every day. West Riding at 47s. 6d. have put on a half-crown. Brazilian Tractions at 10½ are ⅛ better, and even the Mexican issues have improved. Mexican Light and Power 5 per cent. bonds at 50 are ten points to the good. One of the few markets in the Stock Exchange to fail in attracting interest is that for rubber shares. In these the market conditions remain painfully quiet.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Dividend 1933.	Dividend 1934.	Price Dec. 10.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	3⅞	—	3 17 5
City of London	1	7½	7½	37/–	—	4 1 0
Clyde Valley	1	7	8	44/–	+1/–	3 12 9
County of London	1	10½	10½	54/–	—	3 17 9
Edmundson's 7% Pref.	1	7	7	36/–	—	3 17 9
Do. Ord.	1	7	8	43/–	+1/–	3 14 5
Elec. Dis. Yorkshire	1	9	9	46/–	—	3 18 3
Elec. Fin. and Securities	1	12½	12½	3 7/16	—	3 12 9
Elec. Supply Corporation	1	11	11	3½	—	3 10 5
Lancs Light and Power	1	7½	7½	38/–	—	3 19 0
Lond. Assoc. Electric	1	—	—	34/6	—	4 1 2
London Electric	1	7	8	39/–	—	4 2 0
London Power deb. Red.	Stock	5	5	109½	+1	4 11 4
Metropolitan	1	10	10	52/–	+6d.	3 17 0
Midland Counties	1	7	7	38/6	+6d.	3 13 9
Mid. Elec. Power	1	8	8	41/3	—	3 17 6
North Eastern Electric Ordinary	1	6	6	34/–	—	3 10 7
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	51/3	—	3 18 0
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary	1	10	10	57/6	—	3 9 5
Do. do. 6% Pref.	1	6	6	32/–	—	3 15 0
Scottish Power	1	8	8	42/6	—	3 15 3
South London	1	7	7	34/6	+6d.	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	25/6	—	5 17 8
Yorkshire Elec.	1	8	8	45/–	+6d.	3 11 0

Public Boards.

Central Electricity 1950–70	Stock	5	5	116	—	4 6 0
Do. 1955–75	"	5	5	119	—	4 4 0
Do. 1951–73	"	4½	4½	111	+½	4 1 1
Do. 1963–93	"	—	3½	103½	—	3 7 8
London Elec. Trans. Gtd.	"	—	2½	97	—	2 11 8
London & Home Counties, 1955–75	"	4½	4½	114	—	3 19 0
London Passenger Transport, A...	"	—	4½	122½	+1	3 13 6
Do. do. B...	"	—	5	128½	—	3 17 10
Do. do. C...	"	3½	4	109	+1	3 13 5
West Midlands Joint Elec. 1948–68	"	—	5	116½	—	4 5 10

Telegraph and Telephone.

American Tel. & Tel.	$100	9	9	162½	+5	5 10 3
Anglo-Am. Tel. Pref.	Stock	6	6	122	+2	4 18 4
Do. Def.	"	1½	1½	30	+½	5 0 0
Cable & Wireless 5½% Pref.	"	2¾	4½	106	+½	3 17 10
Do. A. 7½% Ord.	"	Nil	Nil	29½	—	—
Do. B. Ord.	"	Nil	Nil	9	—	—
Globe Tel. & Tel. Ord.	10	2½	3½*	15½	—	2 5 0
Do. do. Pref.	10	6	6	14½	—	4 4 3
Great Northern Tel.	10	20	20	41	+½	4 17 9
Marconi-Marine	1	10	7½	36/3	—	4 2 9
Oriental Telephone Ord.	1	12	12	3½	—	*3 16 10

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	"	5	5	1405	+100	—
Do. do. Pref. Ord.	"	8	8	173½	+5	4 12 3
Brazil Traction	100	—	—	10½	+½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	98½	—	5 1 6
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	3	—	—
Do. 1st Bonds	$500	5	5	50	+10	—
Victoria Falls Ord.	1	20	20	3⅞	—	—
West Riding	1	5	6½	47/6	+½	2 14 9

Manufacturing Companies.

Aron Electricity Ord.	1	10	15	60/–	—	5 0 0
Assoc. Elec. Ord.	1	4	6	44/–	+3/–	2 14 7
Do. Pref.	1	8	8	39/–	+1/6	4 2 1
Babcock & Wilcox	1	6	8	52/–	—	3 1 6
British Aluminium Ord.	1	5	7½	44/6	+3/–	3 7 6
British Insulated Ord.	1	5	15	5	+½	3 0 0
Brush Ord.	Stock	Nil	Nil	51	—	—
Callender's	1	15	15	3½	+ ⅛	3 17 5
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/–	—	12½	6⅛	– ⅛	0 11 0
Do. 8% Pref.	1	8	8	38/9	+½	4 2 7
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9 0
Electric Construction	1	Nil	3½	32/6	+ ⅛	2 3 1
Enfield Cable Ord.	1	25	25	5½	—	4 15 5
English Electric	1	Nil	Nil	20/–	+6d.	—
Do. do. Pref.	1	Nil	Nil	24/–	—	—
Ericssons Tel.	5/–	—	24	37/6	+ ⅛	—
Ever Ready	5/–	35	35	24/9	+9d.	7 1 5
Ferranti Pref.	1	7	7	27/3	—	5 2 9
G.E.C. Pref.	1	6½	6½	32/6	–6d.	4 0 0
Do. Ord.	1	8	10	74/–	+2/–	2 14 1
Henley's	1	30	30	7½	—	4 4 3
Do. 4½% Pref.	5	4½	4½	5½	—	3 16 8
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	5	7½	48/3	–6d.	3 2 3
Siemens Ord.	1	6½	4	27/6	+½	2 18 2
Telegraph Construction	£1	Nil	Nil	25/–	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1934

4395. "Mercurial electrical cut-outs." F. T. Jenkins and S. D. Sparks. February 9th, 1934. (Cognate application 7563/34.) (438190.)

4659. "Synchronous motor arrangements." P. F. Beer. February 12th, 1934. (438352.)

10532. "Braun tube and a method of producing the same with controlled light intensity." E. Hudec. April 8th, 1933. (438117.)

11680. "Scanning devices for television." Scophony, Ltd., J. H. Jeffree, and G. Wikkenhauser. April 18th, 1934. (438424.)

13061. "Mounting of lamps for street lighting." Hardy & Padmore, Ltd., T. J. Southall, and C. Guise. May 1st, 1934. (Cognate application 25727/34.) (438118.)

13773. "Loading of telephone lines, particularly cables, for carrier-frequency current transmissions." Siemens & Halske Akt.-Ges. May 24th, 1933. (438125.)

13899. "Electric motor controllers." H. G. A. R. Wilson. May 8th, 1934. (438197.)

14115. "Contact devices having variable electric resistance characteristics and process for manufacturing materials used therewith." J. Picton. May 10th, 1934. (Cognate application 20374/34.) (438130.)

14299. "Gas or vapour filled electric-discharge devices and circuits therefor." J. A. Robinson. December 29th, 1933. (438360.)

14354. "Ionic-discharge device and circuit therefor." J. A. Robinson. March 23rd, 1934. (438362.)

14425. "Regulation of supply frequency in electrical distribution systems." T. B. Somerville and Associated Electrical Industries, Ltd. May 12th, 1934. (438364.)

14435. "Distance relay mechanism for the protection of electrical installations." R. Widerőe. May 12th, 1934. (438139.)

14440. "Electric resistance alloys." British Driver-Harris Co., Ltd. (J. M. Lohr). May 12th, 1934. (438140.)

14472. "Door-operated electric switches." B. W. Baer. May 14th, 1934. (438202.)

14582. "Electrical welding machines." Allgemeine Elektricitäts-Ges. May 13th, 1933. (438143.)

14691. "Thermostatic electric switches." British Thermostat Co., Ltd., and M. Payne. May 15th, 1934. (438372.)

14758. "Automatic electromagnetic cut-outs for controlling electric currents." C. A. V. Bosch, Ltd., N. R. Wood, and A. V. Waters. May 16th, 1934. (438431.)

14804. "Method of and means for cooling electrical apparatus immersed in liquid." British Thomson-Houston Co., Ltd., and N. Appleyard. May 16th, 1934. (438438.)

14841. "Direct-current electric motor equipments operated in connection with rotary direct-current transformers." S. E. Pritt, W. T. Gray, and Associated Electrical Industries, Ltd. May 16th, 1934. (438374.)

14845. "Electromagnetic carbon-pile regulators." J. Stone & Co., Ltd., and A. J. S. Brown. May 16th, 1934. (438440.)

15015. "Propulsion apparatus for trolley-buses and like electric locomotives." J. Stone & Co., Ltd., and Sir J. T. Prestige. May 18th, 1934. (Cognate application 1512/34.) (438442.)

15026. "Electric insulation of wire." British Driver-Harris Co., Ltd. May 23rd, 1933. (438444.)

15064. "Directional radio transmitting arrangements particularly applicable for determining bearings." C. Lorenz Akt.-Ges. July 13th, 1933. (Addition to 405727.) (438446.)

15065. "Electrical transmission circuits." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). May 18th, 1934. (Addition to 8349/34.) (438447.)

15279. "Electric-arc convertors." General Electric Co., Ltd., H. B. Bailey, and J. W. Gibson. May 22nd, 1934. (438457.)

15338. "High-voltage electrical discharge tubes." T. E. Allibone and Associated Electrical Industries, Ltd. May 22nd, 1934. (438147.)

15456. "Electrical measuring instruments." W. Casson and Associated Electrical Industries, Ltd. May 23rd, 1934. (438378.)

16418. "Direct-current electric traction motors." General Electric Co., Ltd., and F. M. Jackson. June 1st, 1934. (438210.)

18526. "System of and apparatus for converting electric currents." British Thomson-Houston Co., Ltd. June 22nd, 1933. (438217.)

19048. "Polarised electromagnetic relays." Central News, Ltd., and C. C. Davies. June 27th, 1934. (438468.)

21102. "Stand for heating electric hand-irons." D. Donaldson. July 19th, 1934. (438472.)

21470. "Electric switch operating devices." Igranic Electric Co., Ltd., and S. R. Wright. June 23rd, 1934. (438223.)

21652. "Time-base circuits for cathode-ray oscillographs." General Electric Co., Ltd., and L. C. Jesty. July 24th, 1934. (438386.)

22840. "Electric switchgear." English Electric Co., Ltd., and A. A. Heath. August 7th, 1934. (438225.)

23668. "Incandescent cathodes particularly for gas-filled discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 7th, 1933. (438227.)

24171. "Electrical distribution boxes and the like." A. Sadler (Schiele & Bruchsaler Industriewerke Akt.-Ges.). August 22nd, 1934. (438477.)

25119. "Electric oscillators for use with cathode-ray tubes." J. C. Wilson and Baird Television, Ltd. August 31st, 1934. (438285.)

27025. "Protective arrangements for electric motors." General Electric Co., Ltd., N. C. Smart, and A. A. Chubb. September 20th, 1934. (438390.)

29829. "Electrical-friction massage apparatus." F. Proksch. October 18th, 1933. (438392.)

30299. "Control system for electric-circuit breakers and the like." British Thomson-Houston Co., Ltd. October 21st, 1933. (438287.)

31212. "Moving-coil voltage regulators." Ferranti, Ltd., and E. T. Norris. October 31st, 1934. (438289.)

36263. "Transmission of electric energy through gaseous-discharge convertors." Akt.-Ges. Brown, Boveri & Cie. December 23rd, 1933. (438166.)

36760. "Electric lamps for vehicles." H. Clark & Co. (Manchester), Ltd., and H. V. Carlisle. December 21st, 1934. (438169.)

36996. "Means for connecting together electric cables." Surridge's Patent, Ltd., and R. Surridge. December 24th, 1934. (438170.)

37396. "Electric switch devices of mercury or other fluent material type." British Thomson-Houston Co., Ltd. December 30th, 1933. (438172.)

1935

529. "Electric circuit interrupters." Westinghouse Electric & Manufacturing Co. January 6th, 1934. (438401.)

1248. "Thermostatic switches." British Thermostat Co., Ltd., and M. Payne. January 14th, 1935. (438303.)

2534. "Receiving apparatus for wireless telegraphy." C. Lorenz Akt.-Ges. February 2nd, 1934. (438177.)

3725. "Electric storage water heaters." T. S. Shenton. February 5th, 1935. (438308.)

3749. "Transformer with artificially enlarged leakage." E. Wirz. February 6th, 1934. (438309.)

6816. "Electron-discharge devices." Telefunken Ges. für Drahtlose Telegraphie. March 2nd, 1934. (438181.)

8888. "Electric-arc welding apparatus." British Thomson-Houston Co., Ltd. March 21st, 1934. (438405.)

11119. "Apparatus for measuring or indicating the state of charge and discharge of an electric accumulator battery." Britannia Batteries, Ltd. (Accumulatoren-Fabrik Akt.-Ges.). April 10th, 1935. (438407.)

12220. "Loop antennæ." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 9th, 1934. (438326.)

12222. "Arrangements for resonance indication in superheterodyne receiving sets." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 2nd, 1934. (438255.)

13010. "Manufacture of dielectric materials." F. C. Stephan and Telegraph Condenser Co., Ltd. May 1st, 1935. (438329.)

14061. "Electrodeposition of nickel." Harshaw Chemical Co. February 14th, 1935. (438412.)

15398. "Electrically insulated coupling for metal pipes or conduits." Lygos Proprietary, Ltd. July 14th, 1934. (438262.)

18211. "Electrically driven washing machines." E. Hellmich. June 29th, 1934. (438336.)

18586. "Electric insulating material." British Thomson-Houston Co., Ltd. June 30th, 1934. (438337.)

19514. "Electric power transmission systems." M. H. Carpmael (Veneinigte Zunder-und Kabelwerke Akt.-Ges.). July 8th, 1935. (438339.)

19640. "Current collecting devices." Westinghouse Electric & Manufacturing Co. August 8th, 1934. (438341.)

19845. "Thermal current-responsive devices." British Thomson-Houston Co., Ltd. July 14th, 1934. (438455.)

20691. "Indirectly heated cathodes for cathode-ray tubes." British Thomson-Houston Co., Ltd. July 21st, 1934. (438343.)

21515. "Gas-discharge lamps." British Thomson-Houston Co., Ltd. July 28th, 1934. (438417.)

27668. "Phase shifters." W. Casson and Associated Electrical Industries, Ltd. May 23rd, 1934. (Divided out of 438378.) (438419.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 4th:—

Micatric. No. 563462. Class 5. Wire in round or flattened section for use in making resistances. No. 563463. Class 8. Electrical resistances and electric heating elements, being resistances for use in electric irons, stoves, hot plates, and the like—Copeland & Jenkins, Ltd., Elektron Works, Norlington Road, Leyton, London, E.10.

Paramount. 562298. Class 6. Electrically driven rotating turntables for window display.—Automatic Aids, 672, Holloway Road, London, N.19.

Lumaneon. No. 564090. Class 8. Neon signs.—City Glass Co., Ltd., 167, West Graham Street, Charing Cross, Glasgow, C.4.

No. 563457. Class 13. Electric switches (ordinary), electric lampholders and combined electric switches and plug contacts.—The General Accessories Co., Ltd., 22, Euston Buildings, George Street, London, N.W.1.

Beru. No. 563959. Class 13. Sparking plugs.—Beru Gesellschaft, Ludwigsburg, Germany. (British representatives: Chatwin & Co., 252, Gray's Inn Road, W.C.1.)

New System of Electrical Units

Following a revision in 1921 of the international treaty known as the Convention du Métre, under which at present thirty-two nations co-operate in the maintenance of the international prototype standards of the metre and kilogramme, the Comité International des Poids et Mesures in 1933 recommended the eventual substitution of the "practical absolute system" of electrical units for the present "International" system. The International Committee of Weights and Measures has decided that the actual substitution shall take place on January 1st, 1940. In collaboration with the national physical laboratories, the Committee is establishing the ratios between the international and corresponding absolute units. It will not be necessary for any existing electrical standard to be modified to make its actual value conform with the new units for the majority of engineering applications.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abergele.—Waterworks pump house, with electrically driven centrifugal pump, for Manchester T.C.; chief engineer, Waterworks Office, Town Hall, Manchester.

Barking.—Central arcade, Cambridge Road; Intrade, Ltd. Factory, River Road; F. McNeil & Co., Ltd.

Barnard Castle.—Houses, Tenfield estate; U.D.C. surveyor.

Beckenham.—School (350 places), for the Church of England managers; Rev. C. A. S. Page, The Rectory, Coney Hall, West Wickham.

Bilston.—Houses (276), Millfields estate; borough surveyor.

Birkenhead.—School, Upton, and technical college, Borough Road; director of education.

Birmingham.—School at the corner of York Road and Russell Road, with electrical work; Education Architects' Department, Council House.

Blackburn.—Public baths (£76,000); borough surveyor.

Bolton.—Cinema, Ashburner Street; Odeon (Bolton), Ltd. Technical college; Lanchester & Lodge, architects.

Brixworth.—Houses (36), White Hills Way; T. Wilson & Sons, Ltd.

Bromley (KENT).—Cinema, Hayes; C. H. Gibson, Ltd., builders, Croydon.

Buckinghamshire.—School (288 places), Cippenham, for County E.C.; D. E. Cooke, secretary, Aylesbury.

Castleford.—Houses (138), Redhill estate, with electrical work; C. R. Smith, surveyor, Town Hall.

Chelmsford.—C.o.E. senior school, adjoining Guy Harlings, for E.C.

Cirencester.—Houses (50); Wentworth Jones, U.D.C. surveyor.

Congleton.—Senior schools, Waggs Road, for Borough E.C.; B. Widdows, architect, Derby.

Cowley.—Cinema, Cowley Road; Oxford & Berkshire Cinemas, Ltd.

Cuckfield (SUSSEX).—Houses (48) and flats, Hurstpierpoint; A. Hutchings, R.D.C. surveyor, Boltro Road, Haywards Heath.

Dover.—Schools, St. Radigunds and Shatterlocks, for E.C.

Droitwich.—Houses (25), Upton Warren, for S. I. King, Waterloo Street, Birmingham.

Dudley.—Houses (100), Baptist End Road; borough engineer. Cinema, Northfield Road, Netherton; E. Ward Dawkins.

Dundee.—Cinema and shops for Vogue Cinemas, Ltd., Glasgow; John McKissack & Son, architects, 68, West Regent Street, Glasgow.

Eastbourne.—Café-restaurant, &c., for Town Council; borough engineer. Cinema, Lismore Road; Gaumont British Picture Corporation, Ltd.

Edinburgh.—Houses (182), Granton Mains housing estate, with electrical work; E. J. Mackay, city architect, City Chambers. School, Pilton (£57,000); J. S. Johnston, architect.

Edmonton.—Houses (302), eleven shops and an hotel, on land adjoining Nightingale Road; New Ideal Homesteads, Ltd., Ideal House, Carlton Road, Erith. Houses (71), Crescent Road; Clifford & Clifford, 28, Ealing Road, Wembley.

Epsom.—Houses (473), Nonsuch Vale estate, for Gleeson Development Co., Ltd.; F. Sutton Smith. Library, fire station extensions, &c.; Williams, Pettett & Gardner, architects, Ashley Road. Church, London Road, Ewell, for the Congregational Trustees; Rev. E. Parkes Perry.

Essex.—Junior and infants' school, Upshire, for County E.C.

Fifeshire.—Additions to Kirkcaldy West School, for County E.C.

Fletton.—Baptist church, George Street; W. E. N. Webster, architect.

Forfar.—Houses (98), Easterbank; Alex. C. Miller, burgh surveyor, Council Chambers.

Glasshoughton (YORKSHIRE).—Houses (72), Bath Road, for Fox Bros. & Dukes.

Glengarnock.—Extension of steelworks (£250,000); Messrs. Colvilles, Ltd.

Grays.—Houses (88) and flats; H. S. Goodall, U.D.C. surveyor.

Great Sankey.—Factory; Mersey White Lead Co., Ltd., Warrington.

Handforth (CHESHIRE).—Houses (228), Homelands estate; Tomlinson Bros., builders, Wilmslow Road.

Hetton-le-Hole.—Houses (200); A. H. Fennell, housing architect, Bridge End Chambers, Chester-le-Street.

High Wycombe.—Houses (37), Bowerdean Valley estate, for Colbourne Estates, Ltd. Shops, flats, &c., Crendon Street and Castle Street, for Crendon Properties, Ltd. Factory, Lake End Road, for S. Fane.

Hindley (LANCASHIRE).—Houses (38), Bridgewater Street, for J. C. Lancaster.

Horsham.—Cinema, North Street; Odeon Theatres, Ltd.

Hull.—Extensions to Cottingham Hospital; city architect.

Hyde.—Houses (38), Brookfield estate, for C. H. Pike, Lodge Lane. Houses (68), Dukingfield Road, and elementary school, Garden Street and Clarence Street; J. H. Ward, borough surveyor, Town Hall. Shopping centre, Woodfield Avenue; W. G. West, builder, Highfield Park Estate, Bredbury, near Stockport.

Irish Free State.—(DUBLIN).—Laying underground power cables for the Electricity Supply Board; technical director, Electricity Supply Board, 37, Merrion Square, Dublin, C.18. (DUN LAOGHAIRE, CO. DUBLIN).—Electrical installation, Municipal Technical School, for the Vocational Education Committee of the Borough; F. F. MacCarthy, chief executive officer, Municipal Technical Institute, Dun Laoghaire. (MULLINGAR, CO. WESTMEATH).—Power station, Mental Hospital, for the Committee of Management of the Institution; J. R. Boyd Barrett, chartered architect, 61, South Mall, Cork.

Irvine (AYRSHIRE).—Town Hall; burgh surveyor.

Kettering.—Houses (105), near Pipers' Hill Lane; Drury & Co., builders, 4, Market Place.

Kirkcudbright.—Houses, Millflats, and on other sites; Mr. Mackinnell, architect.

Lancashire.—Laundry, Park Hospital, Davyhulme; Stephen Wilkinson, county architect, Preston. Junior schools, Besses-o'-th'-Barn, for County E.C.; John Tinline, Ltd., builders, Bury.

Lanchester (Co. DURHAM).—Cinema, Langley Park; D. Crawford, architect, Market Chambers, Market Street, Bishop Auckland.

Leek.—Head offices for the Leek and Moorlands Building Society; secretary to the Board, 15, Stockwell Street, Leek.

Liverpool.—Flats, Horatio Street and Lawrence Street (£21,482), with electrical work; Unit Construction Co., builders.

Loanhead.—Houses (60), Kennington Avenue scheme; Alex Hogg, burgh surveyor, Council Chambers.

London.—(CATFORD).—Houses (145), Whitefoot Lane; Wates (Streatham), Ltd. (ISLINGTON).—Rebuilding Poole Park School (£36,200); L.C.C. architect. (LEWISHAM).—Houses (52), Veda Road; Thos. Sawyer & Son, Ltd., Roxley Road, S.E.13. (STREATHAM).—Hostel for Furzedown Training College (£46,660); L.C.C. architect. (WOOLWICH).—Houses (138) and flats, Middle Park estate; borough engineer. Cinema for Bernstein Theatres, Ltd.; Bovis, Ltd., 35, High Street, W.1.

Luton.—Houses (56) and flats, Solway Road; W. H. Guest Hubbard, architect, Bridge House, 21, New Bedford Road.

Malton (YORKSHIRE).—Houses; G. D. Channon, architect.

Manchester.—Hotel, Wythenshawe housing estate, Northenden (£35,000); city engineer.

Middlesbrough.—Factory; Price's, Tailors, Ltd. School, Whinney Banks; director of education.

Mildenhall.—Houses (48); R.D.C. surveyor.

Newcastle-on-Tyne.—Houses, Fergusons Lane, Daisy Hill, Scotswood and Two Ball Lonnen estates; R. G. Roberts, housing architect, 18, Cloth Market.

North Berwick.—Municipal offices and Town Hall; burgh surveyor.

Northern Ireland.—(LISBURN).—Automatic telehone exchange; secretary, Ministry of Finance, May Street, Belfast.

North Riding.—Court house, Northallerton (£23,862), for C.C.; G. W. Lazenby & Co., Ltd., builders, Ferryhill.

Northwich.—Houses (78); J. Birtwistle, R.D.C. surveyor, Whitehall, Hartford, Cheshire.

Orrell (LANCASHIRE).—Houses (44), Prescott Lane and Latham Lane, for W. F. Heaton.

Oxford.—Houses (34), Barracks Lane; E. Organ & Sons. Houses (52), Hillside estate, Marston; Calcutt & Hunt, Ltd., Isolation hospital (£83,960), and offices, Blue Boar Street (£26,000); city surveyor. Shops and flats, Rose Hill; P. Chase, Gardener & Co.

Paisley.—Additions to works for J. & J. M'Callum, Ltd.

Plymouth.—Houses (218), Weston Hill estate, St. Budeaux; Davis Estates, Ltd. Secondary school, Montpelier (£43,456); Pearn Bros., Ltd.

Raunds.—Houses (24), Crow Spinney site; G. Whittam, U.D.C. surveyor, Council Offices.

Salford.—Houses (200), Duchy and Sommerville estates (£89,500); borough engineer.

Seaton Delaval (NORTHUMBERLAND).—Council offices; A. Dorin, U.D.C. surveyor.

Sedgefield.—Cinema, Chilton, for E. Stephenson; R. Burke, architect, Singleton House, Northumberland Street, Newcastle-on-Tyne.

Selkirkshire.—School, Parsonage Road, Galashiels, for County E.C.

Sheffield.—Houses (73), Hurlfield Avenue; F. Talbot. Houses (46), Warminster Crescent; W. & J. Laver. Factory, Bowling Green Street; Lewis, Rose & Co., Ltd.

Stretford.—Cinema, Edge Lane; Jackson & Newport (Lancs), Ltd.

Torquay.—Houses (100), Shiphay Park estate; J. Lloyd.

Trowbridge.—Houses (120), Lower Studley; U.D.C. surveyor.

Tyldesley.—Houses (98), Astley housing site; F. E. Jones, U.D.C. surveyor.

Wallsend-on-Tyne.—Houses (152), Bewicke estate; J. A. Blench, borough engineer.

Walsall.—Houses (113), Harden estate (£29,739); Jack Winstance, Ltd.

Warwick.—Houses (22), Hanworth Road, for Coventry Industrial Estates, Ltd.

Wellingborough.—Extensions to works, Oxford Street, for York, Ward & Rowlatt, Ltd., Oxford Garage; Talbot Brown & Fisher, architects, Burystead Place.

West Bromwich.—Houses (54) and bungalows, Claypit Lane and Hambletts estate, with electrical work; D. Ellison, borough surveyor, Town Hall.

Westgate-on-Sea.—Rebuilding station, for the Southern Railway Co.; chief engineer, Cannon Street Station, London, E.C.4.

Whickham-on-Tyne.—Houses (74), Sunniside estate; T. Fenbow, U.D.C. surveyor.

Wiltshire.—Senior school, Chippenham, for County E.C.; director of education, Trowbridge.

Wolverhampton.—Cinema, Skinner Street; Odeon Theatres, Ltd. Extensions to Eye Hospital, Compton Road; governors. Houses (36), Wyrley Street; A. Poole, Son & Co.

Worthing.—Houses (86), Terringes Avenue; Willmore Phillips, Ltd.

Worcester.—Houses (240), Corn Meadow Lane, for Bennett's Housing Association, Ltd.; secretary.

York.—Municipal offices, The Castle; Donald H. McMorran, architect, 14, North Audley Street, London, W.1. Houses and flats; Tarran Industries, Ltd., builders, Hull.